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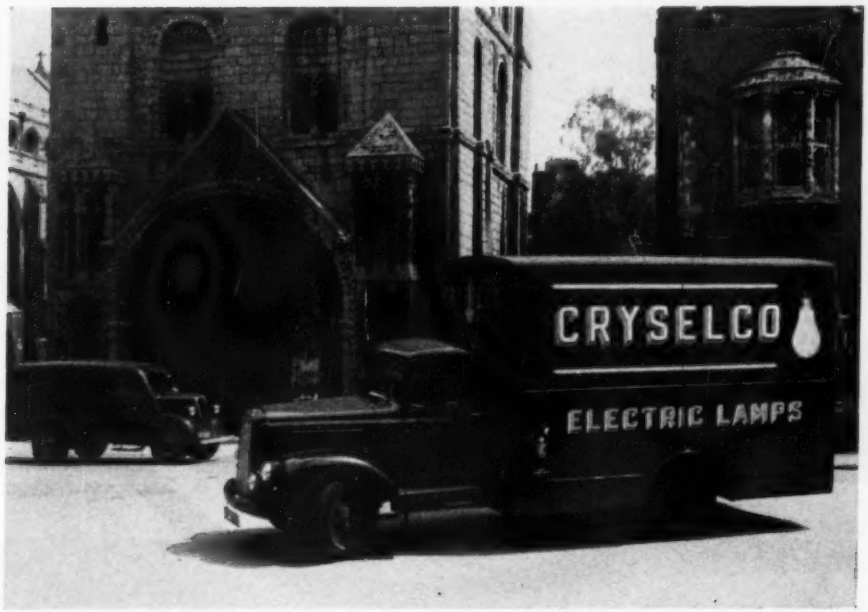

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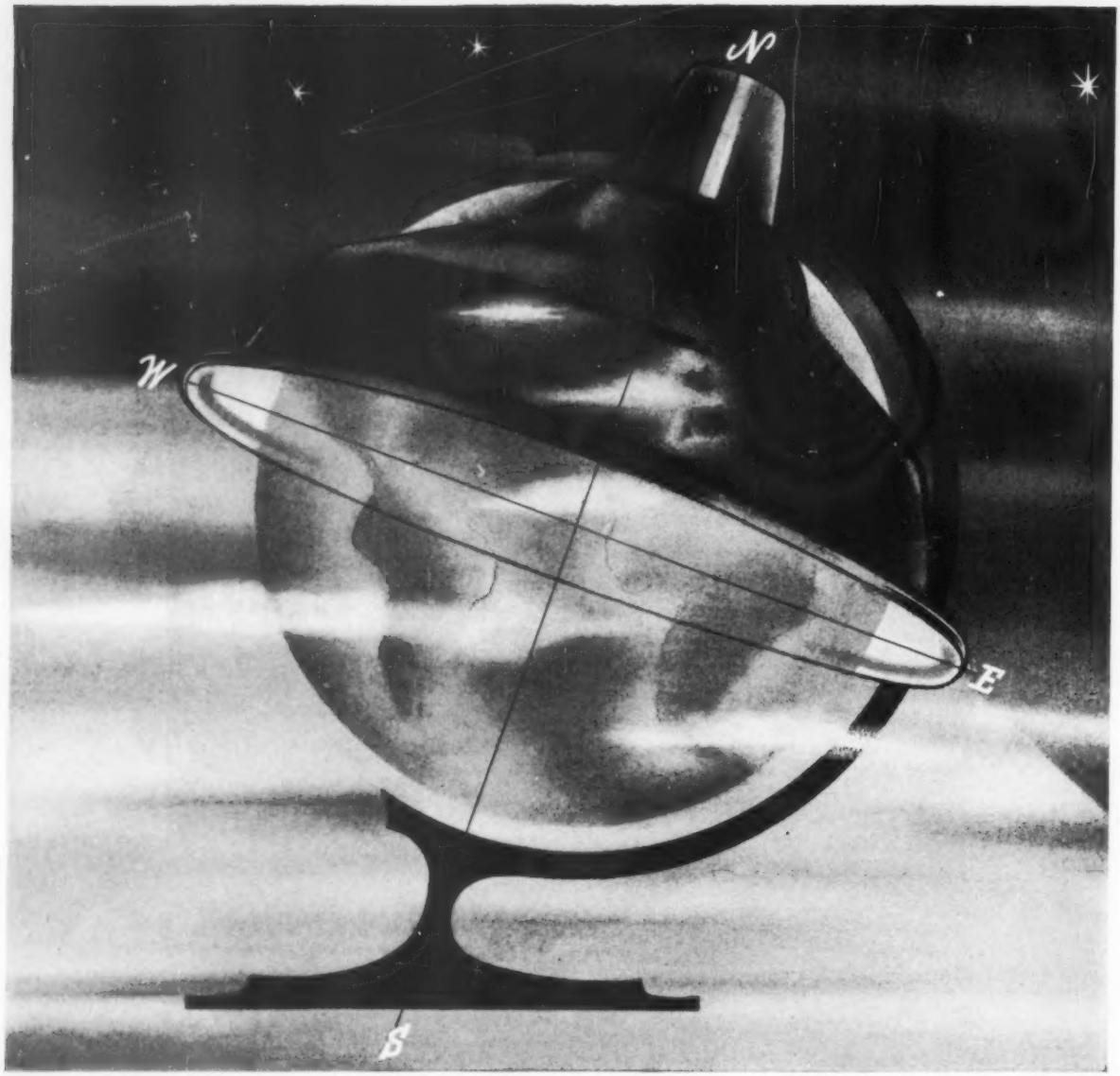

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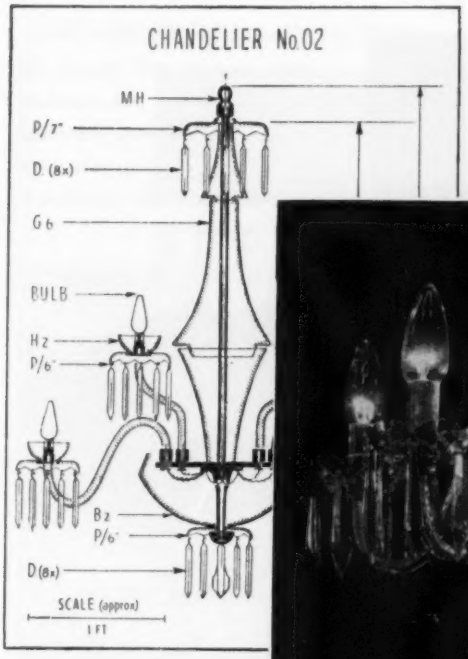

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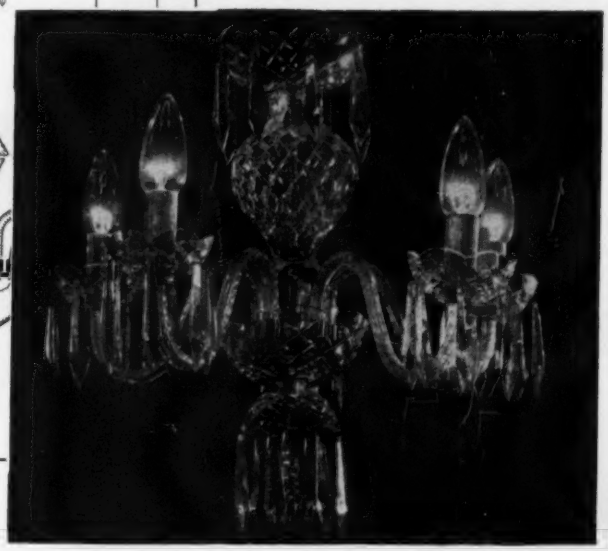

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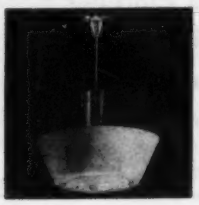

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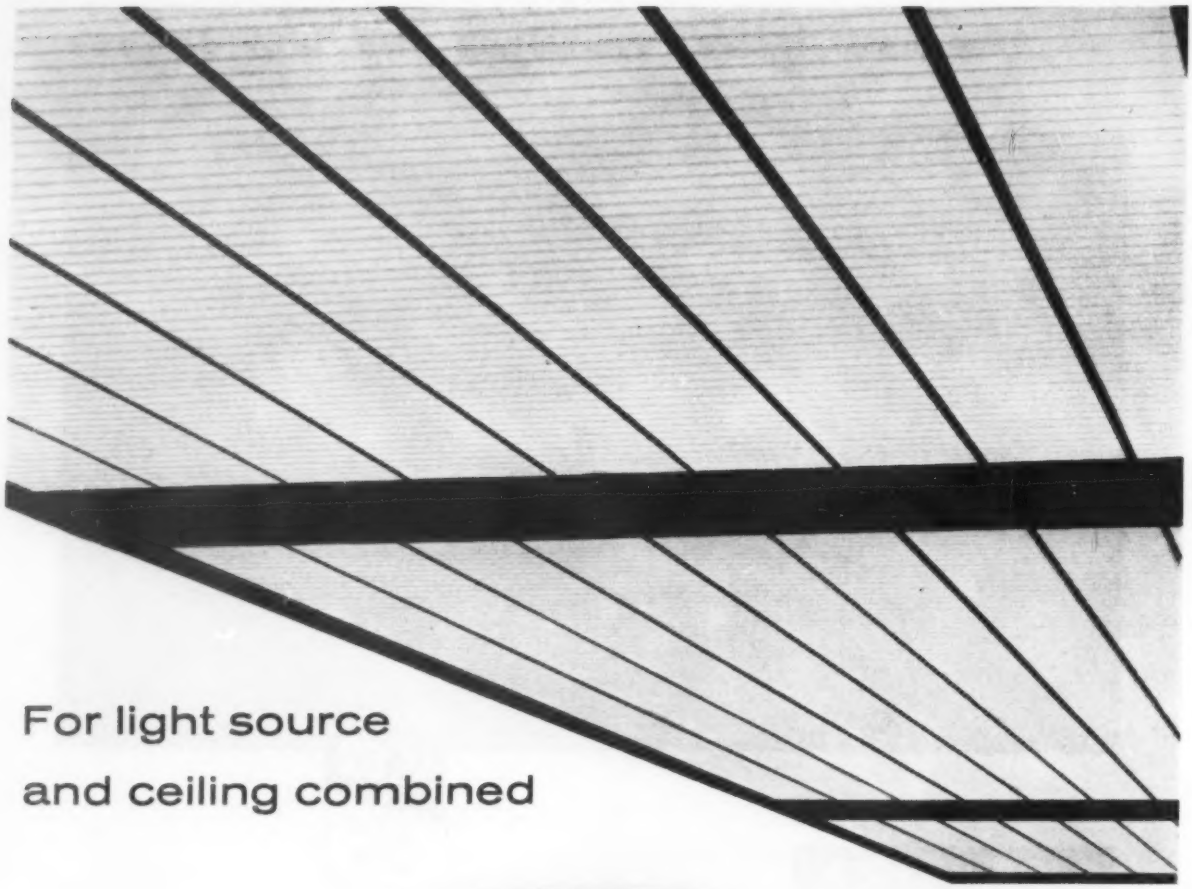

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Light and Lighting

LIGHTING

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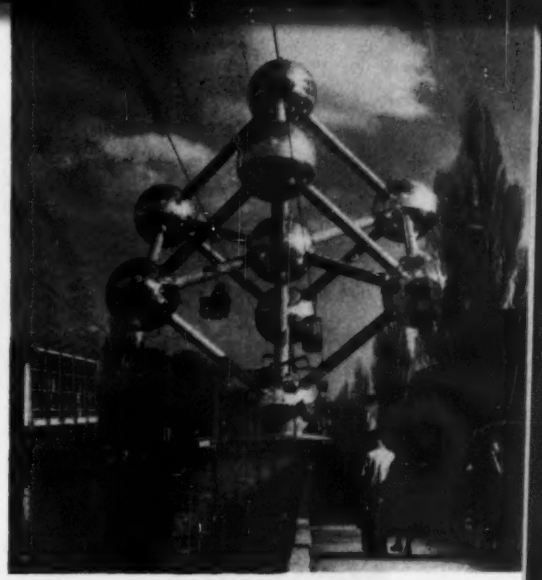
contents

Lighting and Seeing

THE temporal and geographical proximity of the Southern Optical Congress at Hastings in the second week of May, and the Summer Meeting of the Illuminating Engineering Society at Eastbourne in the third week of May, prompts us once again to urge the closer co-operation of opticians and lighting specialists, since both have a common objective—the facilitation of sight. Would it not be a forward step to hold a joint congress occasionally, whereat those who minister to man's dioptric needs and those who minister to his light needs could become better acquainted with the problems each has to deal with in serving the most wonderful of the human senses? Not only this, but such contact and interchange of knowledge and ideas would broaden the outlook of both parties and lead each to appreciate better not only the potentialities of his own specialty but also its limitations. From this should come a livelier realisation of the need for each to promote the utilisation of the services of the other. Local joint meetings there have been in the past and more of these are desirable. But a "get-together" in a regional or a national lighting and seeing congress is yet to come.

Ablaze of light and one of the few buildings lit by tungsten lamps, the USA pavilion at night is a magnet for visitors to the exhibition. A circular building over 300 ft. in diameter, its acrylic plastic walls are lit from within by 432 150-watt reflector spot-lamps. Inside, a ceiling of acrylic sheeting is lit from below by 1,600 spot-lamps, while the coarse mesh which is suspended below it is lit by another 400 lamps concealed in the inner crown of the structural ceiling.

The Brussels Exhibition, 1958



WITH nothing but praise for an outstanding achievement, the editorial staff of *Light and Lighting*, just back from Belgium, have made a special effort to give readers at the first opportunity a glimpse of the Brussels Exhibition. We shall return to the subject, to discuss it in detail, at regular intervals during the course of the exhibition but, since the British Press, as a whole, appears to be " playing down " what in our opinion is one of the most exciting events of post-war Europe, we are pleased to devote some of our space in this issue to general views of the 500-acre site, in addition to showing some of the first photographs of the exterior lighting.

The aim of the exhibition is to give the countries of the world an opportunity to demonstrate to one another their scientific, industrial, cultural and social achievements. Belgium and her colonies occupy about half the site, while in the Foreign section over fifty countries are represented, including—one was pleased to note—many of the smaller nations of Asia, Africa and South America. There is an international section, including UNO, OEEC and the European Coal and Steel Community; an area devoted to a reconstruction of how part of Brussels appeared in the year 1900; a fun fair, a planetarium and a zoo; several cinemas and innumerable restaurants, cafés and bars.

One of the significant things about the exhibition is that most countries (the exceptions, incidentally, including the UK) have chosen as their principal medium of expression the architectural form of their pavilions. Indeed, the diversity of style, structural ingenuity and aesthetic sensibility of most of the buildings is a continuous delight to the eye as one strolls around the site. Particularly noteworthy in this respect are the pavilions of Canada, Yugoslavia, France, Japan and Israel.

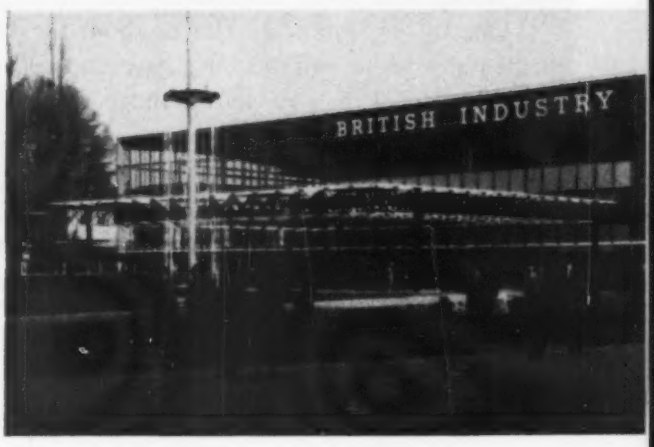
In excluding the UK from this list, it should be made clear that the British Government Pavilion is in other respects outstanding. Partly because it is so different and partly because of the clever display techniques, it is one of the most popular pavilions at the exhibition.

In this architectural playground, as one might expect, the lighting plays a very big part, and, attractive as the exhibition is by day, at night (and, perhaps, even more at dusk) it becomes a wonderland. It was the aim of the organizers that the site as a whole should be lit mainly by

Left, the three spires of the Hall of Tradition, part of the British Government pavilion. The embellished faces of the five principal sides of these spires house over 4,000 15-watt pigmy lamps which produce a coloured design in blue-green and white. The tops of the spires are floodlit by 1,000-watt projectors. Below, the British Industry pavilion by night and by day. It is indirectly lit by warm white fluorescent lamps, the total load for the 60,000 sq. ft. building being 50 kw. The neon sign is 64 ft. long, the 3-ft.-high letters having white opal " Perspex " faces.

spilt light from the pavilions, and in this respect, without there having been any compulsion, the exhibition succeeds superbly. With most of the pavilions walled with glass (again the UK pavilion is an exception) and with very high intensities of light the general rule, the avenues are, at night, flooded with light. Only in the gardens and park areas is there a substantial amount of outdoor lighting equipment, though even here there is no more than is absolutely necessary and the lighting is not overpowering.

In general, few complicated lighting techniques have been employed, the architects and lighting engineers having, in the main, used standard lighting equipment. It is in the way they have used their equipment that their skill is revealed and it is hoped that the photographs give some indication of this. We shall, of course, describe the lighting in detail in forthcoming issues, but to mention for the time being a few of the things that stand out most clearly in our memories, and as a guide to those planning a visit to the exhibition in the near future, we would draw attention to the following: The way in which the United States pavilion stands out because it is almost the only pavilion to be lit with tungsten lamps, having a vallarium of coarse mesh lit from above and below; the decorative pattern on the outside walls of the British pavilion, created by 4,000 coloured pygmy lamps; the massive batteries of louvred projectors in the extreme corners of the French pavilion, which shine into the interior of the building and illuminate its glass-fibre walls; the use of coloured louvred ceilings in the Parisian pavilion (one of the few pavilions where coloured lighting has been employed); and the luminous ceiling which floods with light the main hall of the Belgian Congo pavilion. Note also the strips of directional lighting set into the paving of the Heysel entrance area, and the clean design of the illuminated directional signs.



BRUSSELS, 1958

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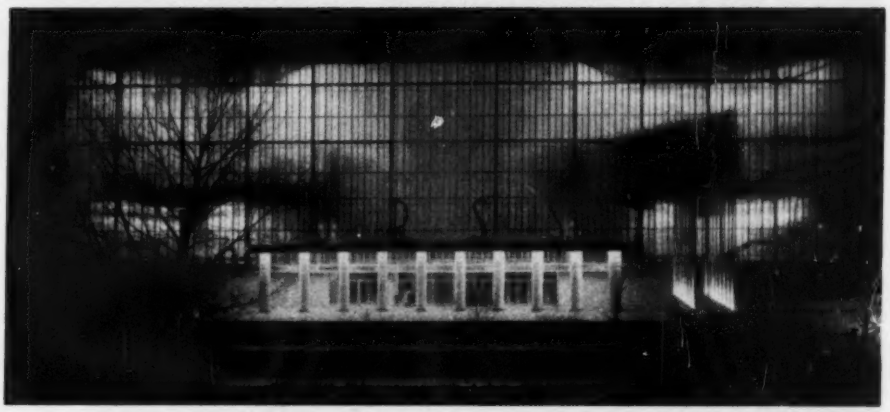
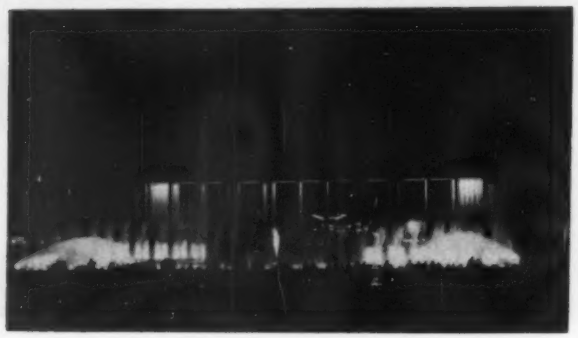


Entirely clad with "Perspex" and glass, respectively, the USA and USSR pavilions (top and centre) are sited adjacent to each other facing on to a large piazza, as seen in the photograph below. The cinema on the extreme left is part of the Soviet exhibit. The main Soviet pavilion is a rectangle nearly 500 ft. long and 250 ft. wide. A huge skylight admits daylight, while at night it is lit by 385 fittings each housing four 40-watt fluorescent lamps and 1,350 125-watt fluorescent lamps fixed direct to the ceiling. The illumination level is 35 lm/ft² increasing to 50 lm/ft² at the entrance.

BRUSSELS UNIVERSAL EXHIBITION (cont.)

Above: Framed by the massive structure of the French pavilion—from the engineering point of view perhaps the most exciting building at the exhibition—are seen the nine spheres of the Atomium. Its design is based on the structure of an iron crystal enlarged 150,000,000 times, and the 54-ft.-diameter spheres are connected by 10-ft.-diameter tubes housing escalators. At night, the polished surfaces of the spheres reflect light from the various sources around, while 320 10-watt lamps on the surface of each sphere are switched to give a scintillating effect. In the photograph on the left, part of the Atomium is seen from behind the Aluminium pavilion, while in the photograph below it can just be discerned behind the illuminated fountains near the main entrance in the Place Belgique. This area is linked with the Atomium by water ladder which is lit by cold cathode tubing controlled by colour-change apparatus.



The growing tendency, both in factories and offices, for large numbers of people to work together in one big area increases the importance of good working conditions. In the following article on this subject Dr. Kalff emphasises the inter-dependence of the various factors upon which good working conditions depend. He draws attention to the problem of integrating lighting, acoustic, heating and ventilating systems with the construction of the building, and suggests that there is a need for a new type of expert who could co-ordinate the work of the structural engineer, the architect, the interior decorator and the various specialists concerned with the lighting and other services.

Lighting Modern Working Areas

By Ir. L. C. Kalff

MANY factors in our surroundings influence the way we work, our comfort at our work and the satisfaction we gain from our work. These factors can be divided into four groups :—

(a) The visual surroundings.
(b) The acoustic and auditive surroundings.
(c) The temperature.
(d) The condition of the air.

More and more it is becoming understood that each of these factors is important; that they are interrelated and must be considered simultaneously. In doing so, it is wrong to assume that all working conditions are acceptable so long as they are not disagreeable or injurious; on the contrary, we must study human reactions to every impression that enters our mind through our senses, with a strong preference for the *positively* comfortable ones.

Visual Surroundings

Visual surroundings cannot be defined by the lighting level alone. Of equal importance are brightness and colour, and the pleasure which the things we see may give us. There are two visual fields in places of work—that which we see while we are looking at our work and that which we see when we look up from our work.

Seeing becomes comfortable (a) when we see our task easily and precisely—with the correct quantity and direction of light; with a good background; and without glare, specular reflections or too-vivid contrasts in luminance or colour; (b) when we can concentrate on our visual task, there being no disturbing areas of brightness, colour or movement; and (c) when we are pleased by what we see, there being nothing ugly in sight.

Other Conditions

Acoustic conditions are of great importance in large working areas, where many people work together. Sufficient sound absorbing material—mostly in the ceiling—is necessary to avoid disturbing background noises, but it is equally important that voices should be intelligible and as pleasant sounding as possible during talks and meetings. In factories where there is a constant level of noise caused by machines, the atmosphere can often be improved by short periods of carefully chosen music in the morning and the afternoon.

The heating system in the working area must be calculated in relation to the temperature outside, the radiant heat of the sun and the heat produced by the workers themselves. It is necessary also to have an adequate system for obstructing the direct rays of the sun, since work is impossible in direct sunshine.

It goes without saying that a good air-conditioning system, bringing fresh and pure air into the place of work, is of the greatest importance. Such systems need, however, elaborate arrangements for the transport of the air, so that the necessary space for ducts must be planned well in advance of the construction of the building.

Limitation of Choice

It is obvious that these four conditions for good working circumstances, each of which has a great influence on the construction, the shape and the appearance of the working area, place strong limitations on the freedom of choice of the architect. For this reason, a somewhat limited number of types of working area in offices and factories have been developed. Similarly, the lighting expert who has to plan suitable lighting systems for these areas has to take

Dr. Kalff is with Philips Lighting Service Bureau, Eindhoven.

Below, an early (10-year-old) example of a lighting system for large offices where the lighting can be switched on in zones parallel to the windows. Areas 40 ft. from the windows have a constant level of 45 lm/ft² of artificial light, to give working conditions as good as those near the windows. The photograph shows clearly the central duct for air-conditioning and the acoustical tile ceiling, which reduces the background noise to a low level. Since the installation was completed the number of clerks working in this office has been doubled without causing overcrowding, which proves that a 'combined system' can give high efficiency in the use of floor space. Bottom, an excellent example of the control of all working conditions. There is a high level of shadowless lighting, with a grid of baffles made of acoustic tiles hanging from a ceiling also clad with these tiles. Above the ceiling are the ducts for the conditioned air with transparent plastic anemostats between the grid.

into account all the same factors and the number of good solutions to the lighting problems is also restricted.

The high cost of new installations makes it necessary that they should not quickly become out-dated. We have seen very rapid developments in lighting during the last 20 years and there has been a big increase in illumination levels. There is no reason to believe that this development has now come to an end, and it is advisable, therefore, to choose, for new installations, high illumination levels—e.g., for offices 40 lm/ft²—and to consider methods whereby the level may easily be raised by 30-50 per cent. In modern offices the greatest possible flexibility is necessary, so that offices of different sizes can easily be formed by moveable partitions. For this reason, architects often design their buildings on a modular grid based on the smallest possible area in which one or two desks can be placed. The building is then constructed so that partitions can be placed on any line of the grid. This arrangement limits the placing of lighting fittings on or in the ceiling and, generally, we find in these new buildings a form of ceiling construction which allows the partitions, the acoustical absorption panels and the built-in lighting fittings all to be moved.

Lighting and Colour

We must not forget that lighting—both natural and artificial—has a big influence on the colours (and on the appearance generally) of the walls, floors and furniture, and, indeed, on the whole visible surroundings. For this reason it is necessary to choose the materials and the colours of all these objects so that they have a good appearance under all conditions of lighting. This requires close co-operation between the lighting engineer, the architect, the interior designer, and all those persons who decide what furniture, flooring and machinery is to be used. In the past it has been difficult to bring about this type of co-operation, and it is necessary to overcome the impression gained by many architects, as well as their clients, that the lighting engineer wants a say in matters that are not his concern. The lighting engineer may have difficulties also in convincing the colour expert or interior decorator how important is the influence of the colour of the lighting on the appearance of the chosen colours. But this should not stop the lighting

Above, a long general office, without partitions. The ceiling is of sound-absorbent material, with recessed lighting fittings. Above the row of columns is the duct for the air-conditioning. Columns and walls are clad with light-green stove-enamelled metal panels, which are easily removable and interchangeable. The high illumination level makes work independent of daylight. Left, a striking new office for 90 clerks and 60 draughtsmen in a big car factory. Laylights provide ample daylight, well screened off by high baffles of acoustic material, while wide ducts between the laylights house continuous lines of lighting fittings and the ducts and outlets for the conditioned air.

engineer from trying to do his work as completely as possible; otherwise incomplete and disappointing results are unavoidable.

Those who, through our (Philips') publications, have learned our views on the composition of the visual field in colours, lines and brightnesses, or who have visited the Philips' demonstration laboratory in Eindhoven, will know that we believe in the possibility of making an assessment of the visual field before the building is erected or the desks or benches are installed. Thus, valuable directions can be given to the architect, the interior decorator, the lighting engineer and the colour expert. So far, only a few installations have been carried out for which this close co-operation by all the parties concerned has taken place. The ideal working circumstances we have in mind are still unusual, and the large buildings about which we are speaking are to be found in only a few countries. Moreover, comparisons are difficult because of differences caused by climate and by local traditions.

The Open Office

Developments in heating, air-conditioning and lighting have made it possible for large numbers of people to work together (in comfort) in one large area. In North America these developments have been most rapid because of the tremendous concentrations of population in the big American cities. Moreover, the big difference between the climate in summer and the climate in winter has forced employers and their architects to face up to the problem of providing a comfortable environment, while in Europe this need has been less widely accepted.

Thus, in many countries of Europe there is still little knowledge of these new techniques, and one has often to overcome strong resistance from employees who are accustomed to individual offices and do not want to give up their "splendid isolation." For the European architect it is difficult also to solve the many new problems involved in the construction of high buildings with complicated service installations. The installation of modern services in buildings which are constructed traditionally is difficult and often leads to compromises. Far better results become possible if the architect takes into account the complexity of the installations from the moment he starts planning the building.

Every architect, in planning a factory, an office building, a laboratory or even a hospital, should think first of the working conditions for the staff, for these conditions determine the well-being of the worker, his efficiency and the satisfaction he gains from his work. In this article we are concentrating on the visual impressions received by the worker, but we find over and over again that it is necessary to point out the connection between lighting and the other factors that influence his well-being because these factors cannot be considered separately.

Changing the Visual Task

The visual task itself is usually defined beforehand and only rarely can it be changed so that perception becomes easier. The easiest tasks are those in which the material to be handled has a light colour and a simple shape, e.g., white paper. However, it is possible to make the reading of, say, a shorthand report easier by the correct choice of paper and pencil. The position of the paper, too, can be a big influence on the ease of reading—e.g., the paper as used in typewriters is often badly lit in the place where the typist's attention is concentrated, because it is held vertically and receives little light. The lighting can be improved by mounting a small reflector or mirror on the machine to concentrate the light on the place where the typewriter key touches the paper. On the other hand, it should be possible to change the position of the paper in the typewriter by changing the design of the machine so that the paper leans backwards and catches more light.

It is obvious that it is not often possible to influence the visual task to a great extent. There are, however, several good examples of an improvement in visibility obtained by changing the visual task itself. For example, dark or black threads in a textile mill can be made visible by using a light background. Small objects like the steel spools of a sewing machine can be seen better in yellow light than in white light. The extremely small differences in colour which have to be seen when sorting out tobacco and cigars are more perceptible under the bluish-white light of colour-matching lamps. Type-setting often becomes possible only by using large light sources of low brightness, giving narrow highlights on the edges of the dull-grey metal of the type.

For the visual task itself, it is necessary to use all possible factors, such as shadows, silhouettes, mirror reflections, coloured light, and the direction of the light, as well as adequate illumination levels, to obtain maximum visibility. Sometimes local lighting may be used for the visual task, but generally a general lighting system is preferable.

The surroundings of the visual task must not present too great a contrast in brightness or colour with the visual task itself. Usually a relatively warm colour with medium-to-good reflectance is to be preferred. Varnished wood, for example, is a good background for visual tasks, while light grey or green can be used for furniture and machines. The visual field outside the surroundings of the visual task should be filled in by darker and cooler colours, while strong colours and vivid bright patches should be avoided, just as glare and movement are avoided.

A 'Relaxation Area'

From time to time the worker must relax the muscles of his eyes and rest them for a few seconds. He can do this by looking up from his work and finding a new visual field at a greater distance which, in general, has a similar construction of brightness and warm colour. This new field can be, for example, a light and warm-coloured wall opposite to him, with light directed on to it. Preferably, however, this "relaxation area" for the eye should have a certain significance or beauty. A painting, a coloured print or a few flowers can be used for the purpose, according to the nature of the premises. On

Opposite page (top), a big drawing office, silenced by the cork flooring and the acoustic tiles of the ceiling. Also in the ceiling are the recessed fluorescent lighting fittings, providing 50 lm/ft² on the drawing boards. Opposite page (bottom), a diamond-die factory, where holes of 10 microns are drilled in small diamonds. A maximum of daylight is desirable without sunlight. For this reason the hall is orientated north/south; the windows have wide horizontal baffles against direct sunshine; and the top windows, which can be opened, have "Thermopane" glass. Artificial light has been built into the ceiling in continuous strips each comprising four continuous rows of fluorescent lamps, screened off by white metal louvres. The factory is very quiet and lies in a fine green park, so as to avoid dust, and gives a pleasant outlook for the staff.

looking up, the eyes should not meet any strongly distracting impressions, such as glare from visible light sources, very strong contrasts, highly saturated colours or moving objects. One should avoid also the introduction of patches of high brightness in places where they have no "meaning" or where one would not expect to find them.

Colours can be a great help in improving the proportions of the working space. Thus, in a narrow room an impression of spaciousness can be obtained by using cool and bright colours on the long walls. Similar colours can be used on a ceiling that is too low, while it is possible to improve the apparent proportions of a room which is too high by choosing dark colours for the ceiling and throwing only a little light upwards, so that the upper part of the room becomes virtually invisible.

A New Expert

For the construction and organisation of "ideal" working spaces a new type of expert is needed. He should be someone who, from his own experiences, knows the value of all the considerations I have mentioned. He must be trained in all the relevant branches of science and sociology; he must understand fully all the factors that make up the visual field of the clerk or factory worker; and he must have a decisive voice—at a high level—in the company administration. He should be the co-ordinator who brings together the architect, the interior designer, the lighting engineer, the acoustics adviser, the heating and ventilation specialist, and the purchasers of furniture and machinery.

He must appreciate that the visual comfort of the worker may depend on the building itself, on the design and colour of the machinery he uses, and even on such minor items as the type of paper used by typists and clerks. He must also have an understanding of the worker's desire to have around him those things that express his own personality—souvenirs, portraits of the people he loves, plants and flowers and other things that remind him of his family and his hobbies. This new type of expert must be able to discuss all these matters with those who are responsible for the various details. He must be able to make people listen to him; to make them consider his arguments seriously; and to convince them that he is right.

Of course, the appointment of such an expert is possible only in very large enterprises where vast numbers of people work together, yet the total number of workers employed in small firms is many times greater than the number employed by the few very big firms. Hence, as the welfare of the small groups of workers is just as important as that of the large groups, there is an important role to be played by the advisory offices for factory organisation and efficiency which are already active in dealing with aspects of the subject very close to those dealt with in this article.

Below, a fine modern factory for electronic equipment. Daylight comes from both sides, the employees, mostly girls, facing the end walls. Decoration is blue for the machinery and grey for the furniture, with a few red and orange accents. The ceiling consists of one steel grid, mostly covered with white sound-absorbing material, and partly used as louvres for screening off the recessed lighting. The air-conditioning ducts are concealed above this grid and only the outlets are visible (see detail above).

Relighting of

Gloucester Cathedral

Architect, Col. N. H. Waller, F.R.I.B.A.

Lighting designer, J. M. Waldram, B.Sc., F.I.E.S.

Electrical installation, Drake & Gorham (Contractors) Ltd.

Lighting equipment, The General Electric Co. Ltd.

A NEW method of interior lighting design which enables a lighting engineer to prescribe lighting which will produce the exact patterns of light, shade and modelling desired by the architect was proposed a short time ago by J. M. Waldram. [Details of the method were given in a paper to the IES—see "Studies in Interior Lighting," Trans. Illum. Eng. Soc. **19,** 95 (1954).] The first application of this method in a large building was recently completed at Gloucester Cathedral.

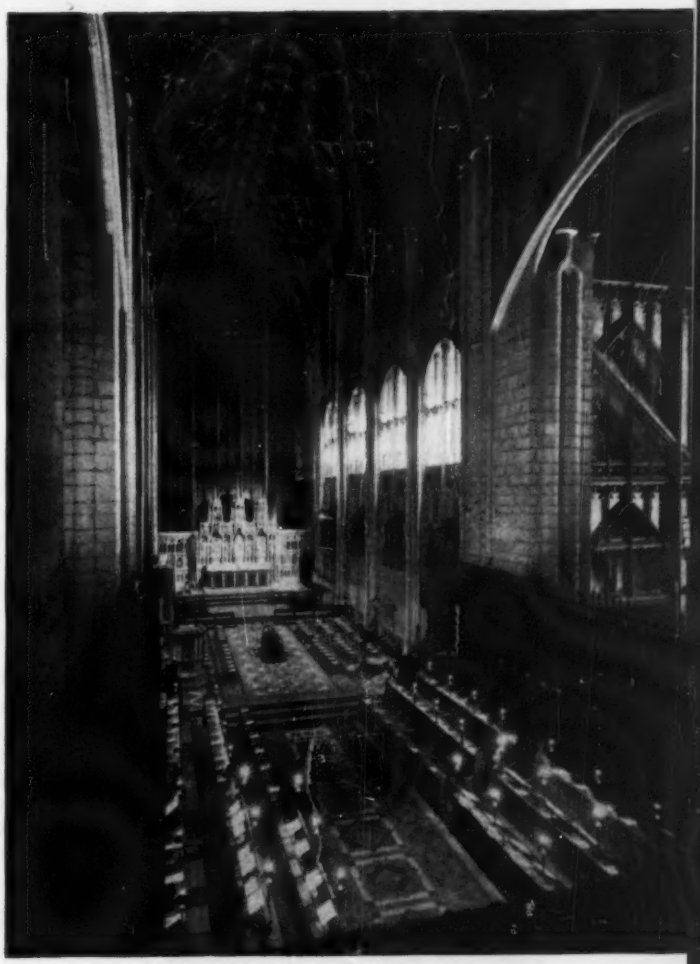
When it became necessary to renew the 50-year-old wiring installation in the cathedral the opportunity was taken to modernise the lighting. A suggestion that Waldram's "Designed Appearance Lighting" system be tried out was accepted by the Dean and Chapter and by the cathedral architect, who were concerned that the new lighting should be appropriate for worship and bring out in the most natural manner the beauty of the structure.

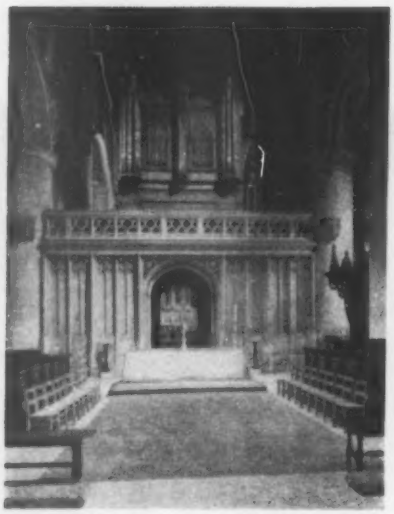
The lighting is achieved almost entirely by the use of a large number of small projector fittings using varying sizes of lamp, all of which are concealed in various parts of the building; there are no suspended fittings and the projectors are visible only from angles of view which are not normal to worshippers or visitors to the cathedral.

The first step in designing the new installation was to photograph the interior from every important position, taking pictures of possible locations for lighting equipment and also taking pictures from those locations to show what the lighting equipment could "see." Surveys were made of the reflection factors of stone and woodwork. The required appearance was then translated into values of necessary incident light and directions of light, and a specification was drawn up for each of the projectors, giving its location and power, the type of reflector to be used, its aiming, and any louvre or accessory required. (This procedure avoided the necessity for extensive experimental work and enabled the electrical installation to be designed and costed at an early stage.)

Gloucester Cathedral presents some unusual lighting

The Choir





problems. It consists of four main spaces in contrasting styles : the nave, the choir and two transepts, all interconnected and providing vistas, from one to the other, which are a principal beauty of the building. In addition, there are the ambulatory, the Lady Chapel and smaller chapels. The cathedral is seldom used as a whole, and services held in it vary from those which involve the use of both the nave and the choir to those which occupy only a part of the choir or one of the chapels. The lighting system while revealing the building as an architectural whole is also designed to be appropriate on all such occasions.

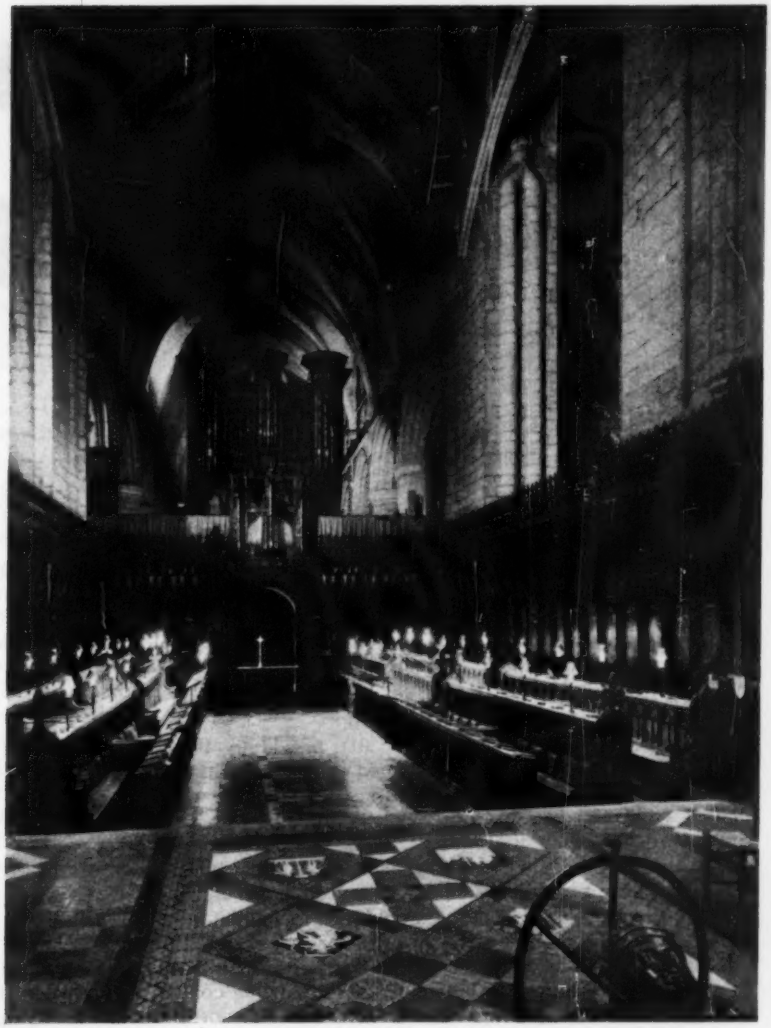
The Lighting Plan

The lighting of the cathedral is effected mainly by concealed fittings and projectors, but decorative wrought iron desk lights, made by Gloucestershire craftsmen and using 25- or 60-watt lamps, have been provided for the choir because they present the most appropriate appearance for services attended by small congregations.

With the designed appearance method of lighting the power, location and aim of the light sources must be

Facing page. Top left, the nave; centre, the nave altar; bottom, the south transept; top right, the Lady Chapel.

This page. Right, view from near the High Altar; below, the High Altar and reredos.



selected with great care so as to produce the desired effect. In Gloucester Cathedral one of the aims was to reveal the modelling of the stonework, particularly the nave columns and the choir. To do this the light sources have been placed to give a "drift" of light from the south side to the north side. This results in the north nave arcade wall and the north aisle wall being brighter than their counterparts on the south side; the north wall is also made brighter than the north arcade.

The nave altar and High Altar, as the principal objects of regard, are fully emphasised. The High Altar and reredos, which are seen at a distance, are both strongly modelled; fairly strong modelling is used for the screen and for the organ which is left darker than the choir beyond it. Other lights delicately reveal the tracery of the east window and the aspiring height of the choir vault. Adequate modelling is also provided for the occupants of each pulpit.

The whole interior is therefore modelled by artificial light in a way that is probably unique for a building of this type and size; the flatness usually achieved by artificial lighting is completely absent.

Left, showing how projectors are mounted on the triforium. Centre, showing type of projector and its mounting. Right, showing projector dismantled from the clamped ring for cleaning.

Lighting Equipment

Since it is impossible to light anything directly without the lighting equipment being visible from the object being lighted, the equipment is installed so that where it is visible it is not usually placed in the normal directions of regard, and so that it is usually invisible to people entering and using the cathedral.

The projectors (150- or 200-watt) providing the main lighting in the nave are mounted on the triforium and, in some instances, on the clerestory. The aisles are lighted from the capitals of engaged columns on the south wall and from the capitals of the main columns on the north side. In the choir, lighting equipment is installed in the openings of the large triforium, where a variety of fittings are placed. Tubular tungsten lamps lighting upwards ensure that the whole of the openings appear to be lighted. Lights for the south transept are mounted in the choir triforium most of them being concentrated in a small gallery on the south side. The north transept is lighted by equipment mounted on the back of the choir stalls.

The majority of the lighting is carried out with a single type of projector designed specially for the purpose and housing either 150- or 200-watt lamps. Its features include provisions for fixing and aiming it in awkward situations, clamping it securely and maintaining it easily without disturbing its aim, focus, or the settings of louvres or spreaders. The basis of the fitting is a cast ring, supported at one side on a mounting giving two motions; the mounting is carried on a half-inch steel rod held in a clamp which can be screwed to the fabric of the building or cemented in position. The silvered glass reflector is held by springs by the mouth against a seating on one side of the ring, and the louvres and spreaders are held on the other side. For maintenance, the whole reflector and lamp assembly can be removed from the ring by unhooking the springs, and it can be replaced accurately in position without disturbing any of the settings.

Reflector lamps (75-watt) with louvres, small, silvered reflectors, and a few small lens spotlights are also used, mostly in the ambulatory. The wiring has been carried out with mineral insulated copper sheathed cables most of which is fixed to the surface of the stonework by non-ferrous clips, screws and wall-plugs. All the cables are either hidden or camouflaged. The total loading of the new system is 40.7 kVA.

The work involved the installation of about 400 lamps of various types and sizes (varying from 15- to 200-watt) and forty-three general purpose sockets. The supply is received from the three-phase system by underground cable entering the crypt and terminating at a main switchboard, which provides a cubicle to house the supply authority's metering equipment. The whole installation, with the exception of maintained services to the heating system, is controlled by contactor switchgear operated from three positions at entrances and the sub-control point.

Comment

This installation at Gloucester has shown that Waldram's method of lighting design is a practical proposition. Though a cathedral offers greater scope than a simple box-type interior, the preservation of the appropriate atmosphere calls for considerable self-discipline on the part of the lighting designer. The result at Gloucester provides a striking contrast with those achieved in some churches, both in this country and abroad, where light has been used to emphasise the architectural features and works of art so that the churches concerned have tended to become museums rather than places of worship.

The absence of hanging fittings alone will surely make architects study this method of lighting. Some adverse criticism will no doubt result because in walking round the cathedral it is possible to see the projectors; in only one or two cases, however, can they be considered to be a nuisance and the majority of them are placed well out of the normal line of sight—from seating positions they cannot be seen.

The flow of light from south to north which has been achieved is difficult to describe either in words or in pictures. Close examination of the latter may show that this has in fact been achieved, but though great care was taken in producing these pictures they do not do justice to the installation, which should be seen. All the photographs were taken at night by the light given only by the installation.

Siemens Edison Swan

The attainment this year of the centenary of Siemens Brothers and Company is an event of particular interest in the lighting world. This is so because, although not founded for the purpose of developing and marketing equipment for electric lighting, the firm is, nevertheless, the doyen of electrical manufacturers who have engaged in, and made important contributions to, the electric lighting industry.

WHEN William and Werner Siemens founded the firm in 1858 it was primarily for the purpose of making telegraph cables and telegraph apparatus. But the idea of electric lighting was not a new one even then, for it was in this year that an arc lamp was installed in the South Foreland lighthouse. Still earlier what was, in effect, the prototype electric discharge tube had been made by Geissler, although not as a practical light source. However, there were no incandescent filament electric lamps and, for as much as 20 years after the foundation of the company, William Siemens himself did not envisage the possibility of the almost universal application of electric lighting which has since come about, although he was an advocate of electric public lighting.

It was, in fact, the development of cables which was to open the way for the progressive adoption of electric lighting on a large scale and in many fields. Of course other developments were necessary as well, the most obvious and important being that of the convenient electric lamps produced independently, and concurrently, by Joseph Swan in this country and by Edison across the Atlantic. The nineteenth century was not unremarkable for instances of practically simultaneous "discoveries" or, at least, of practically simultaneous publication of them. Darwin and Wallace, in respect of the theory of natural evolution, are names as closely linked as are those of Edison and Swan in respect of the incandescent filament electric lamp.

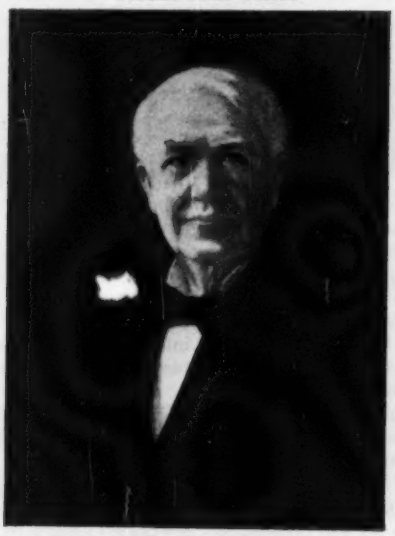
The eighteen-seventies were momentous not only for the advent of incandescent electric lamps but also—at their beginning—for the introduction by Siemens of the self-excited dynamo generator. This was first used for lighting and, together with the subsequent development of power cables, was to play so important a part in the spread of electric lighting. Here, too, was another instance that "great minds think alike" for, besides the Siemens brothers, both Wheatstone and Varley were working simultaneously on self-excited generators.

When this machine became available it was not long before it was utilised as the source of energy for lighting installations in public places both in and out of doors. By 1880 electric lighting installations equipped by Siemens were in use at the Royal Exchange, the Albert Hall and the British Museum. But in those days installations were necessarily confined to the vicinity of the new "lighting machines." These machines had to be quite near to the lamps they were to feed with power; power cables and the distribution of electrical energy from central generating stations were yet to come.

It was the invention of the carbon filament lamp, and recognition of the potentialities of glow lamps, that stimu-

Sir William Siemens

Thomas Alvar Edison



Sir Joseph Swan

lated the development of power cables and power distribution systems, as well as the establishment of an electric lamp industry. Small lamps consuming relatively little energy were obviously suitable for lighting in very many situations where arc lamps, with their maintenance troubles, were not suitable. But they would not come into general use so long as each installation—even those in dwellings—required its own private power-station. In the eighties, however, this was how the matter stood. All the necessities for electric lighting—lamps, fittings, wires and generator—were supplied by Siemens, but those who wanted the new lighting had to buy the lot. An early self-contained installation of this kind was put in at the Savoy Theatre, which D'Oyly Carte built for the ever-popular Gilbert and Sullivan operas. One of the first generating stations to provide a supply to other buildings besides the one it was primarily intended to serve was the Grosvenor Gallery station—the Gallery immortalised by W. S. Gilbert's Bunthorne—

> " A greenery-yallery, Grosvenor Gallery,
> Foot-in-the-grave young man ! "

But the first public power-station was installed by Siemens at the little town of Godalming in 1881. It utilised water-power and converted this to electrical energy for lighting the streets and for sale to private consumers, but, of the latter, there were too few for long survival of the undertaking. What will surely strike the reader as remarkable is that in 1878 a " gate " of more than 20,000 people saw a football match played at Sheffield in floodlighting provided by Siemens equipment. To-day, 80 years later, this sort of thing can be done much better, but, if it is no longer a novelty, most of us think of it as a fairly recent innovation.

Soon after the invention of the carbon lamp, William Siemens died and his nephew, Alexander Siemens, was appointed to direct development of lamps and equipment for electric lighting. An experimental department was established at the Woolwich works, and although this was active for some 15 years all the development of the tantalum lamp, which was introduced in 1905, appears to have been left to the parent company, Siemens and Halske. Indeed, there were no British contributions of note to the development of metal-filament lamps between the turn of the century and the outbreak of the 1914-18 war. However, the development of power cables had followed rapidly the introduction of incandescent lamps and many public supply undertakings were in being before the war. Nevertheless, there were still numerous factories and other establishments which relied only on their own private generating plants at this time.

The war severed Siemens Brothers from the parent company and led to the appointment of a lamp development organisation under P. D. Oakley. This organisation itself underwent considerable development after moving from London to Preston, whence the Siemens lamp works were transferred in 1923. In this year, too, Oakley was joined by J. N. Aldington, then a junior chemist but destined to become chairman of Siemens Brothers and managing director of the new company which now bears the three famous names, Siemens-Edison-Swan. Aldington's influence in the factory grew considerably during the ensuing decade and, from 1933 onwards, his contributions to lamp development brought him more and more into prominence in the lighting world. The Preston laboratory staff was not large, indeed it was extremely small by comparison with that of competitor firms, but its achievements were considerable. Much work was done on electric discharge lamps of various types, including, of course, fluorescent tubular lamps. After the 1939-1945 war the development of the gas arc lamp was one of the major projects carried through by Dr. Aldington

Dr. John Aldington

—who was then Director of Research—and his colleagues. Since the amalgamation of Siemens with Edison Swan, the research organisations of the original companies have been merged and new laboratories have been built at Harlow New Town.

On the production side the output of lamps from the Preston works steadily increased over the years and, from a figure of less than five millions in 1929, it had grown to about 12½ millions by 1955. Inevitably there were changes in the composition of the lamp output during the war years and there was a fall in output during the latter half of the war period when, of course, the consumption of domestic lamps was curtailed. At this time, and for some time after the cessation of hostilities, there were also restrictions on the use of fluorescent lighting.

A very important part of the Siemens business is concerned with telephone cables and telephone equipment. In this sector the post-war years have been characterised by rising output and the development of new equipment of advanced design. For example, the output of telephone dry core cable has trebled in the past ten years and the same is true of telephone exchange equipment. A new telephone handset and cordless exchange switchboards are among the company's important new products.

Reorganisation, rationalisation, expansion of productive capacity, enterprise and initiative in product design, have all been apparent as this historic company approached its centenary. Though it would certainly not be true to say of it that " life begins at 100," it is undoubtedly true that the company has taken " a new lease of life." Under Dr. Aldington's leadership the future should be a bright one. Already, as Lord Chandos announced in his chairman's address at the recently held Annual General Meeting of Associated Electrical Industries Ltd., the sales of Siemens Edison Swan increased by 13 per cent. last year. Incidentally, it is of interest to note that Dr. Aldington's appointment to the board of A.E.I. was confirmed at this meeting.

The story of the first 100 years of " Siemens " is told in detail by J. D. Scott in his essay in the history of industry entitled Siemens Brothers, 1858-1958, published in London by Weidenfeld and Nicolson. To this book the writer of the present brief sketch is indebted, not only for most of the material here used but also for the instruction afforded in industrial history by J. D. Scott's unvarnished tale.

Lighting the Small Stage

This article is intended for those who have to light stage productions, usually amateur, in small halls where the full facilities available in the professional theatre are not necessary. In such halls the funds available are invariably limited, and this article indicates how they might be used to the best advantage.

By FREDERICK BENTHAM, F.I.E.S.

An essential beginning to this subject is an appreciation of stages and staging. For all the talk of centre or arena staging, the thing that most people understand as a stage is in fact a workshop tacked on one end of the hall. This workshop is open on the side facing the audience, and the boundary line, fixed or temporary (defined or ill-defined according to taste), between it and the hall is known as the proscenium opening. The opening through which the audience can actually see being about 24 ft. wide x 12 ft. high in the present context. I stress the term workshop deliberately because the stage is too often finished to the same degree as the rest of the hall, and scenery and all the makeshift that goes to form a show become intruders to be kept at bay and restrained. By all means conceal the workshop by curtains (stately or gay to suit) when the hall is put to other uses, but remember the need to strip for action quickly when the time comes to put on a show.

Given clear space on one level both on-stage (the area seen by the audience) and off-stage in the wings, the next great need is for some suspension framework over the stage. This should not imply anything elaborate like the grids to fly scenery clear of the stage used in the professional theatre; three H-type RSJs running up and down stage (i.e., from the proscenium to the back wall) one on the centre line and one either side about 10 ft. or so away, will provide a rigid fixing to which scenery and lighting can be made off. A big problem is the masking over the stage : one method is to hang vertically a series of short lengths of material, known as borders, at intervals behind each other. Another and better way (shown in Fig. 5) is to fit a semi-permanent ceiling, part of which is hinged at half stage to allow the introduction of curtain tracks and lighting when necessary at that point. Use of ceiling-type masking reduces the essential overhead lighting on the stage to immediately behind the proscenium (the section at C) and over the up-stage edge of the ceiling (at E).

Within the stage area we may expect a scene to be set. Fig. 1 shows a scene made up rather typically of bits and pieces with intervening spaces filled in by curtains ; it just shows scenery—and pretty rough scenery at that. Figs. 2 and 3 show a lounge in which people can move and live. The sole difference between Fig. 1 and Figs. 2 and 3 is lighting ; Fig. 1 is illuminated, Figs. 2 and 3 are lit.

By now it should be clear that stage lighting must conceal more than it reveals. Fig. 1 is an illustration of

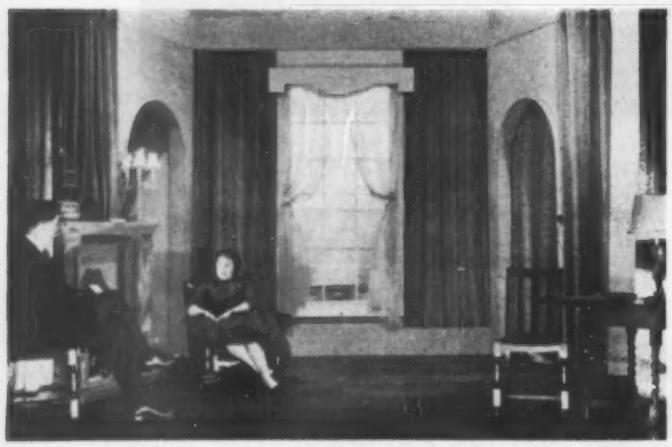


Fig. 1 (Left). Stage scene floodlit from battens and footlights. Fig. 2 (Right). Scene as Fig. 1, but lit by spotlights to represent late afternoon.

the easy way to light the scene by a row of lamps at the front edge of the stage (footlights), a similar row overhead just behind the proscenium (No. 1 Batten), and yet another row behind the centre window (No. 2 Batten). Whether the equipment consists of a row of low-power lamps alternating in compartments with colour filters (Fig. 4) or is bang up to date with lines of fluorescent lamps, the result is the same—light everywhere and shadows pretty nearly everywhere as well. Not only does such lighting destroy scenic illusion, but it also fails to serve the actors.

In Figs. 2 and 3 localised light from spotlights is used except behind the window and archway. The patchwork nature of the scenery is concealed because there is just sufficient light for the background to register. The localised light can be made to seem as if it comes from the fittings on the mantelpiece and table or from the window, and thereby both the time of day and the mood of the play are made clear. More important still, the light, and with it the eye, is directed at the actors.

We can, with localised light, improve the scenery, suggest the time of day and atmosphere, and highlight the centres of action into the bargain. The originals of photographs for Figs. 1, 2 and 3 were colour photographs; of course, colour is a further weapon, but nevertheless it is the placing and modelling with light that counts—colour is helpless when it takes the form of all-over flooding. The scene in these photographs is a scratch affair set on a small stage with 22 lighting circuits—none of which exceed 500 watts. The object of this article is to indicate the basic form that the stage lighting installation in any hall must take in order to become such an instrument of artistic expression.

A stage installation in a tiny village hall may be able to make do with but eight circuits. Between 12 and 24, or at the outside 32, circuits will cover all normal local and school requirements up to and including Town Hall level. For a good civic theatre or Guildhall, 36-54 circuits is proper, and beyond that (and beyond the scope of this article) is the full-scale theatre of 54 to 144 or even 200 circuits.

All the stages in the group with which this article is concerned, whether eight or 24 circuits, have certain principles in common, and these we will now investigate.

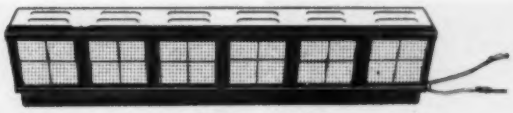


Fig. 4. Compartment equipment used for flooding as "footlights," "battens," "groundrows," or "lengths."

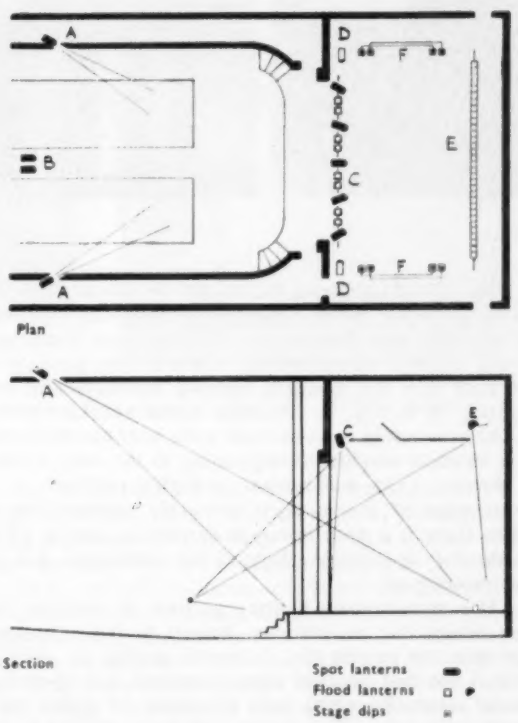


Fig. 5. Plan and section of representative small hall with proscenium opening 20 ft. wide or thereabouts.

Fig. 3. Same scene lit by spots to imitate lighting by candelabra and table lamp.

Consider a hall with a stage across one end; where is the most important lighting position? Well, here is the first shock—it is not on the stage at all; it must be out in the auditorium. This applies equally well whether the stage has a proscenium or not—indeed, I would go further and say that in the case of the latter it is the only possible position.

Only from high at the sides of the auditorium (AA in Fig. 5) can we cross the beams and throw pools of light whose shadows will be cast into the wings (sides of the stage). No matter how far the actor moves down stage (to the front edge) this is the one position to catch him. Note that the beams of light are crossed—this is an important principle as it ensures that the on-stage aspect of the actor is lit and not the aspect towards the wings.

Positioning the spotlights will be considered difficult, but the projector (Fig. 13) is neither too large nor too ugly for wall brackets in full view. Alternatively, a vertical masked slot as at Stratford-on-Avon (Fig. 6) is a good solution. Another form of concealment is shown

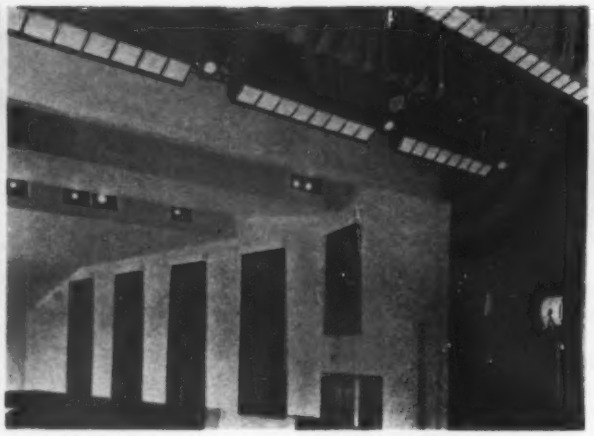


Fig. 6. (Extreme left). View from stage showing masking of auditorium spotlights in Memorial Theatre, Stratford-on-Avon.

Fig. 7. (Left). Masking of spotlights in ceiling of hall in New Zealand, with (above) view from the auditorium.

in Fig. 7. What must be resisted is the urge to hide these spotlights in the ceiling only along the centre line of the hall and thereby give flat-on front illumination which destroys all modelling. Such a front position can be used only for ancillary lighting and never for basic lighting (B in Fig. 5). Another useful ancillary position in the auditorium is on the side walls near the proscenium —a location roughly corresponding to the stage boxes in a theatre. The well-known footlights position at the front edge of the stage is relatively unimportant and when there is a deep forestage cannot be used at all due to the risk of scattering light in the auditorium and over the proscenium.

The second basic lighting position is over the stage just behind the proscenium—known as No. 1 batten or the spot bar or just No. 1 bar (C in Fig. 5). The last title is the best because what is needed is a 1½-inch gas barrel internally wired with a number of socket outlets on flexible tails. This barrel, which should be as long as the width of the proscenium opening, may be fixed rigidly or it may be provided with a winch and fed by flexible multicore cable. It is important, however, not to incur the additional expense of the latter to the disadvantage of the amount of lighting equipment proper. We can do without moving barrels both here and elsewhere on the stage, but we cannot do without the spotlights themselves. In any case, spotlights have to be focused and set from a ladder or steps whether the barrel can be lowered to stage-level or not. The advantage of the moving bar lies solely in maintenance and cleaning—if ever this is carried out.

To No. 1 bar will be clamped five spotlights spaced from the extreme ends inwards and wired on separate circuits. If this number has to be reduced to only two, they must be the end two due to the need to be able to cross the beams. Of course, there might be more than five spots—12 or more being common in theatres—but five is effective enough, and this number was used to light the scene shown in Figs. 2 and 3.

There is need for some general flooding here, and in consequence several individually adjustable floods should be mounted between the spots and bunched on two circuits. Sometimes, as in Fig. 7, lengths of compartment batten are hung between the spots, but this should be done only on very wide proscenium openings where there is no risk of cramping the spots and preventing their direction—often at acute angles. An advantage of the individual floods is that they, too, can be angled and fitted with hoods when necessary; on very small stages there is a constant battle to prevent shadows of windows appearing on the sky backings behind, and angling of floods is a great help.

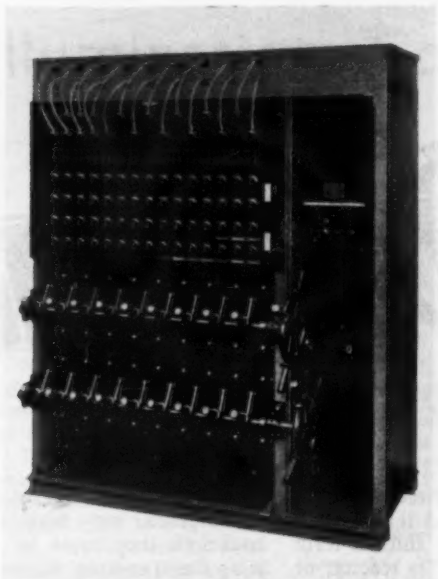
A useful ancillary position for spots on brackets is high at each side of the proscenium (D in Fig. 5). These are known as perch spots from the days when they would have been limelight or an arc with an operator on a platform. These perch spots must be high so that the light passes over any characters nearby and lights those on the opposite side of the stage.

The final basic lighting position (E in Fig. 5) is an overhead barrel up stage about 4 to 8 ft. from the rear wall or backcloth. This rear wall should be plain white (without any pipes, openings or radiators) and hard plastered so that it acts as a rudimentary cyclorama and avoids expenditure on large skycloths. From this last barrel some floodlighting should be suspended, either in the form of separate floods or a continuous compartment batten. Two circuits of alternate compartments is sufficient to provide the light and dark blue usually required for sky effects. If funds permit, a third circuit will be useful for the blush of dawn or some other colour change. The temptation to use primary colour (red, blue and green) filters here for mixing should be resisted as wasteful of light, except where a dance display is staged, though even then colour contrast and change is better from the sides of the stage because it will suit the folds of the curtain setting usual in that kind of work.

I would like to see at each end of the up-stage barrel a spotlight directed across the stage to light actors in the area just in front of backcloth, as any other direction of light is impossible here without spoiling sky effects.

On larger stages an extra barrel half way between the No. 1 spot bar (C) and the up-stage bar (E) becomes necessary. This would hold a mixture of spots and individual floods but should be less ambitious in composition than the No. 1 bar. A stage with more than these three barrels overhead (spaced usually at 8 ft. up and down stage) is no longer a small stage and is outside the scope of this article.

In addition we shall need a fair number of unallocated



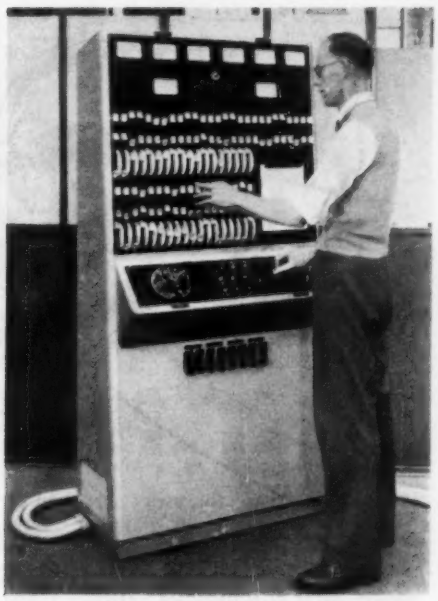


Fig. 8. (Above left). Stage board for 8 circuits sharing 4 dimmers. Fig. 9. (Centre). Stage board for 30 circuits with 18 interlocking dimmers. Fig. 10. (Right). Remote control panel which will take up to 72 dimmers. Dials at top are for a BBC television application and are not normally required.

socket outlets (known as dips) spread about in or near the stage floor (FF in Fig. 5). Their purpose is to feed portable lighting equipment in the wings without the risk of actors falling over the temporary cables. In fact, all the stage lighting circuits on a stage must terminate in socket outlets, preferably all of one size, 5-amp or 15-amp BS, so that equipment can be moved from one position to another. Socket outlets are never switched or fused locally, but must always be brought back to one control point—the "stage-board."

Control

It is essential to provide a stage-board and associated wiring installation no matter what else may be supplied. Whereas the lighting may be augmented for special productions by equipment hired for the occasion, this cannot be readily done in respect of control and wiring. A control-board for hire would be a somewhat bulky item, and in any case temporary wiring should obviously be kept to a minimum.

Care should be taken to ensure that the stage-board does not merely provide simple circuit switching but includes facilities for some optional grouping-up of lighting circuits by the operator. Nearly all stage lighting changes involve several circuits simultaneously, and the operator must be able to group-up to suit the particular lighting cue.

On simple boards this will be done by three position switches (two-way and off) or an equivalent using a pair of switches to each circuit (a one-way and a changeover). Using this arrangement not only can lights be turned on and off individually, but circuits can be switched so that they are fed at will via a master switch (blackout) or independent of it, and thus a group can be killed or put on from one switch. The greater the number of circuits the more extensive the arrangements necessary for forming several variable groups.

The most characteristic part of any stage control is the dimmer. This influences the form of the control and also constitutes the heaviest item of expenditure. It is usually necessary in the smaller halls to economise by having less dimmers than there are control circuits. This does not mean that some circuits are wired to dimmers and others are only switched. It is not possible to forecast which circuits will need dimmers and which will not. Plugging arrangements must be made on the board so that dimmers can be shared out as required, and even changed over as they are released when a circuit reaches full on or off. Fig. 8 shows this type of board with a set of dimmer plugs and sockets each with a shorting switch to bring the light on without the dimmer. An appropriate proportion of dimmers to circuits is 50 per cent. The dimmers are of the inexpensive front-of-panel *slider* type, which, however, do not allow of mechanical collective operation.

Grouping-up for master operation is just as important with dimmers as it is with circuits. With slider dimmers the only way is to use a master dimmer across the master blackout switch so that instead of a sharp cut in the selected lighting a slow fade can be taken. As an economy measure, a master dimmer need only be hired when necessary, but terminals for its connection must be provided on the board. A more elaborate form of control uses dimmers mounted back-of-board with mechanical interlocking of the operating handles for grouping to the master wheels (Fig. 9). It is desirable, whenever funds permit, to provide a dimmer to each circuit. While large numbers of slider dimmers are inadvisable due to the cumbersome way they make up, there is no such objection to dimmers with mechanical interlocking. However, where the size of the control is governed by the centres of the dimmers there are bound to be limits to what may be accommodated in a reasonable position in respect of the stage. An idea of the scale of the board is given by the fact that the dimmer handles in the photograph (Fig. 9) are at 4½-inch horizontal centres. Nowadays

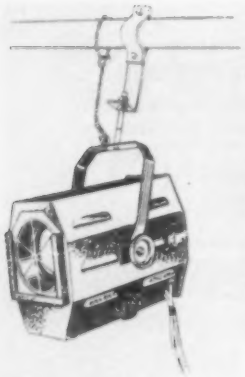


Fig. 11. Focus lantern for focus flooding.

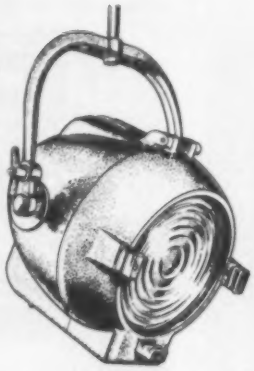


Fig. 12. Fresnel spotlight for soft edge but intense high-lighting.

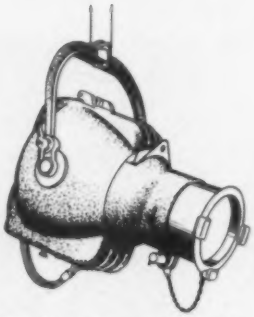


Fig. 13. Mirror spotlight for beam exactly masked to any shape.

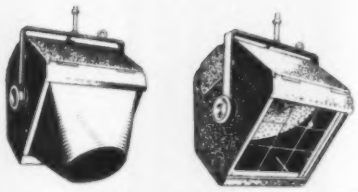


Fig. 14. 150-watt Baby flood with and without masking hood.

there is no excuse for using this type of direct operated board for more than 36 dimmers. Beyond this number remote control becomes essential and a very suitable form of dimmer is available, namely, the saturable reactor, or choke, as it is sometimes called. When remote control is used, one is free to design very compact panels and provide facilities such as presetting to assist the operator. The term presetting is used to cover the ability to set all the next levels of light while the present lighting remains held. Any self-respecting Civic Hall ought to be able to run to a remote control saturable reactor control. Fig. 10 shows how compact remote control dimmers can be.

Placing the stage lighting control is important, but the best that can be done with direct operated types is to put them on the side of the stage—where amateur work is the rule, preferably at stage level. Once remote control is adopted it becomes more logical to put the operating panel somewhere out in the auditorium where the effects produced can be seen.

Lighting equipment

Having provided the fixings for, and the wiring thereto, the actual lighting units can be considered. The stage term for these things is lanterns, and there are two main classes, spot lanterns and flood lanterns, usually abbreviated to just "spots" and "floods." The former are the more important and sub-divide into (a) Focus lanterns, (b) Fresnel lanterns, and (c) Mirror Spots.

Focus lanterns (Fig. 11) consist of a plano-convex lens behind which the lamp can be moved backwards and forwards. The result is a more or less circular beam, variable between 40 and 10 deg. spread, formed of an enlarged image of the filament. This lantern with a 250- or 500-watt lamp is the common spotlight for use in the Spot bar position (C in Fig. 5) on the type of stage here considered.

In Fresnel spots (Fig. 12) the optical principle is similar to that above but a larger diameter short-focus flat lens-plate is used. The result is a softer light of over double the intensity. Fresnel lenses have a tendency to give low-intensity stray light beyond the main beam. In consequence they should never be used in the auditorium. They are most suitable for side lighting from the wings or perches (D in Fig. 5) across the stage, and to give the effect of sunlight through the window as in Fig. 2. Fixings for such lanterns must allow them to be placed very high, and when just in front of the backcloth they must be fitted with barndoors (hinged wing flaps) to keep the stray light in order.

Mirror spots (Fig. 13) have a mirror system to collect the light but the beam shape and size is governed by a gate which is focused by the front lens. This is the only optical system that gives a true spotlight. It is made in a number of wattages from 250/500 up to and including a high-intensity spot for the "following" of artists common in music halls. A feature of Mirror spots is their adaptability to various beam angle ranges by merely changing the lens arrangement. Thus the model in Fig. 13 is available in four beam ranges: 11, 22, 30 or 37 deg. Within the particular range the masking shutter or iris in the gate can do all the rest.

The lanterns shown take 250- or 500-watt Class T projector lamps with medium bi-post caps. The Fresnel and Mirror spots make very efficient use of this light. Although a range of similar lanterns exists for 1,000-watt lamps, generally speaking these will not be necessary in the class of stage covered by this article. Where more light is required it is neater to double up on a circuit as a pair of lanterns side by side. Such an arrangement also provides a good way of producing the asymmetric beam distribution often needed in theatre work. Where spotlights are completely inaccessible during a performance, as, for example, those out in the auditorium, a colour wheel with preset stations operated by a selector switch on the stageboard is reasonable. The professional theatre uses filters independently moved in and out of the beam by electro-clutch-selected motor-operated mechanism. The expense of these devices is not justified in the present context. Incidentally, all colour filters should be of the self-extinguishing acetate sheeting known as "Cinemoid." Dyed gelatine is not stable enough for halls which are used intermittently. Glass is quite unnecessary except as diffusers for Mirror spots.

The floodlights used along with the spotlights would, in the main, be 100/200-watt baby size (Fig. 14) used separately or made up as a compartment batten. Those behind the proscenium (C in Fig. 5) should have medium-angle reflectors with hoods available to further localise the light; those for lighting the backcloth will

(Continued on page 228)

National Illumination Committee of Great Britain*

Report for the Year 1957

It is by no means unusual for the work of the Committee to be somewhat less obvious in the year intermediate between two sessions of the International Commission on Illumination than at other times; the year under review has been no exception in this respect and the amount of business requiring attention has been such that only one meeting of the Committee has been necessary. There has, however, been considerable activity in other ways and practically all the sixteen Working Committees of the Commission International de l'Eclairage (CIE) have met; a few of them have now held more than one meeting. Judging by what has been achieved so far, this method of holding meetings of small groups of experts at any convenient time is likely to add considerably to the amount of useful work of an international character which can be carried out between sessions. For subjects not dealt with by Working Committees, several questionnaires have been either issued or received, by way of preparation of Secretariat Reports.

The Central Bureau of the Commission has continued the issue of Bulletins and Nos. 2, 3 and 4 have now appeared. These have again given information of a general nature concerning the activities of the CIE and in particular the provisional arrangements which are being made for the next session in Belgium in 1959. Each number has been accompanied by appendices, which have given among other things, the revised Statutes, the terms of reference for all subjects, the members of Working Committees and for most countries a list of those responsible for the technical work of secretariat subjects.

Correspondence has been received from the Central Bureau regarding the presentation of papers at the next meeting of the Commission, and members of the NIC/CIE Panel had the opportunity of meeting Dr. A. A. Brainerd, the Chairman of the CIE Papers Committee, when a useful exchange of information took place. The NIC/CIE Panel later considered the question of the submission of papers by Great Britain on the basis of a total estimated number of papers to be presented in 1959 of not more than 20. The NIC/CIE Panel considered that this country would probably wish to submit up to five and all subcommittees have been notified accordingly. The NIC/CIE Panel has recommended that an NIC Papers Committee be appointed to deal with papers submitted from the subcommittees.

Arising out of a decision by the CIE Scope Committee an ad hoc committee has been set up to deal with the study of Reflex Reflectors. The work has been centralised in the Subcommittee on Automobile Headlights and Signal Lights and representatives to the ad hoc committee have been appointed by the subcommittees on the Measurement of Light, Colour of Signal Lights and Signal Lights.

It is announced with regret that the Society of British Gas Industries has found it necessary to resign from membership of the Committee after an association lasting many

* The NIC is affiliated to the International Commission on Illumination. This report was approved at the annual general meeting of the Committee held on Thursday, January 30, 1958.

Constitution of Committee, December 31, 1957

Officers :—

Chairman: DR. S. ENGLISH.
Vice-Chairmen: W. R. STEVENS, H. C. WESTON.
Hon. Treasurer: E. B. SAWYER, British Lighting Council, 2 Savoy Hill, W.C.2.
Hon. Secretary: L. H. MCDERMOTT, National Physical Laboratory, Teddington, Middlesex.
Representatives of Great Britain on the Executive Committee of the International Commission on Illumination: A. G. HIGGINS, H. C. WESTON.

Nominated by the Sponsoring Organisations :—

Illuminating Engineering Society: G. F. COLE, J. G. HOLMES, E. C. LENNOX, L. H. MCDERMOTT, J. M. WALDRAM.
Institution of Electrical Engineers: C. W. M. PHILLIPS, H. R. RUFF, W. R. STEVENS, DR. J. W. T. WALSH, G. T. WINCH.
Institution of Gas Engineers: J. B. CARNE, A. G. HIGGINS, F. C. SMITH, D. M. THOMPSON, W. H. WELCH.

Nominated by the Co-operating Organisations :—

Admiralty: H. A. L. DAWSON.
Air Ministry: J. KEMP.
Association of Public Lighting Engineers: N. BOYDELL, H. CARPENTER.
British Electrical and Allied Manufacturers' Association: J. M. H. STUBBS.
British Electrical Development Association: J. I. BERNARD.
British Lighting Council: A. G. PENNY, E. B. SAWYER.
British Plastics Federation: DR. W. E. HARPER.
British Standards Institution: J. F. STANLEY.
British Transport Commission: A. H. COLE (*British Railways*), H. E. STYLES (*London Transport Executive*).
Building Research Station: W. ALLEN, DR. R. G. HOPKINSON.
Central Electricity Authority and its Area Boards: R. BIRT, M. D. STONEHOUSE.
Electric Lamp Industry Council: W. J. JONES, DR. J. W. STRANGE.
Electric Light Fittings Association: J. H. STUDHOLME, D. L. TABRAHAM.
Electrical Contractors' Association: A. H. OLSON.
Gas Council: J. B. CARNE, F. W. SANSOM.
Glass Manufacturers' Federation: DR. E. PRESTON.
Independent Lamp Manufacturers' Export Group: DR. J. W. STRANGE.
Institution of Municipal Engineers: C. HARPER.
Medical Research Council: DR. W. J. W. FERGUSON, H. C. WESTON.
Ministry of Education: H. E. DANCE, A. P. POTT.
Ministry of Health: D. A. HUGHES.
Ministry of Labour and National Service: M. A. MCTAGGART.
Ministry of Power: J. COWAN, H. C. LISTER.
Ministry of Supply: E. S. CALVERT, F. H. GIBSON, J. L. RUSSELL.
Ministry of Transport and Civil Aviation: DR. H. F. GILLBE, W. HADFIELD, N. F. HILDYARD.
Ministry of Works: W. E. RAWSON-BOTTOM.
National Coal Board: R. BUFFRY, P. N. WYKE.
National Physical Laboratory: DR. W. S. STILES.
Nuffield Foundation: J. MUSGROVE.
Post Office: R. S. PHILLIPS.
Road Research Laboratory: G. GRIME.
Society of Glass Technology: DR. S. ENGLISH.

years. The Road Research Laboratory of the Department of Scientific and Industrial Research has now become a co-operating organisation and has appointed Mr. G. Grime as its representative. Following the dissolution of the Electric Lamp Manufacturers' Association, the newly constituted Electric Lamp Industry Council has become a co-operating organisation and is represented by Mr. W. J. Jones and Dr. J. W. Strange; the British Lighting Council, formerly the Lighting Service Bureau, is now separately represented, by Mr. A. G. Penny and Mr. E. B. Sawyer. The other changes which have taken place in the membership of the Committee are as follows: Mr. F. H. Gibson, of the Ministry of Supply, has taken the place of Mr. McGinnety, whilst Mr. H. C. Lister represents the Ministry of Power in place of Mr. Robinson. Mr. Drake, of the Electric Light Fittings Association, has been replaced by Mr. J. H. Studholme, and Mr. R. S. Phillips has been nominated to replace Mr. Penney, of the Post Office. The British Electrical Development Association, formerly represented by Mr. Dale, has nominated Mr. J. I. Bernard, whilst Mr. Selway, one of the representatives of the Ministry of Transport and Civil Aviation, has been replaced by Mr. N. F. Hildyard.

It is of interest to note that the British Standards Institution has published Handbook 9 dealing with Domestic and Non-Industrial Electric Lighting Installations and Appliances, as well as BS 2818: Auxiliaries for the Operation of Fluorescent Lamps.

S. ENGLISH,
Chairman.

L. H. MCDERMOTT,
Secretary.

Designs of the Year, 1958

Pendant Light Fittings

The "Satina" range of pendant fittings made by Hailwood and Ackroyd Ltd. for AEI Lamps and Lighting Co. Ltd. has been included in the 20 items selected from the wide range of products shown at the Design Centre last year as "Designs of the Year, 1958." The "Satina" range was designed by Nigel Chapman, of the AEI Lamp and Lighting Company's design team headed by Leslie Hubble. This was the only award made within the electrical industry.

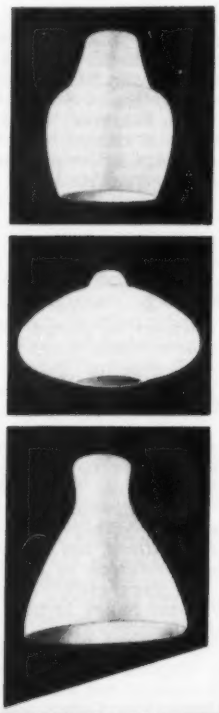
The comments of the COID selection committee on the fittings were as follows: The approach to modern electric lighting is perhaps more international to-day than it has been for a long time; it is often hard to distinguish a Scandinavian fitting from a German or a German from a British one, but these similarities are likely to occur in any period of design with a strongly marked character that transcends national frontiers; other periods, such as the Empire or Regency, have shown the same tendency. In such a situation national differences are revealed in minor points, in weights and measures and in finishes and detailing. The judges have chosen this range of pendant fittings and this particular shade (though others almost as good are available in the range) for just these fine points—the quality of the satin-finished opal glassware, which is attractive both lit and unlit; the delicacy of the bracket-arms; the unostentatious use of brass in combination with black rods; and the general elegance of the range in all sizes. Ease of assembly and accessibility for cleaning and lamp replacement have also been carefully considered in these designs.

Certificates were awarded to the manufacturers of the selected items at the Design Centre on May 8 by the Duke of Edinburgh, who in his speech said: "First of all may I congratulate all the winners of the certificates. I think it is always very pleasant to win a prize even if you do not think you deserve it, or even if you do not think the prize is very important. But I am convinced that the Council of Industrial Design is right in using this system of selecting Designs of the Year. I suppose if I didn't believe it I wouldn't be here, but at best the method is a very imperfect one of encouraging better designs. One of its disadvantages is that it depends on the opinion and judgment of the judges. I find that that is the best way in which to start an argument—although I do believe that argument in this case is better than apathy.

The Duke of Edinburgh presenting the award to John Clement, Sales Director, AEI Lamp and Lighting Co. Ltd.

As good design is immeasurable it is quite obvious that for every one design selected for the Designs of the Year there must be several others that were fairly close to it, but even so this idea is better than nothing and encourages some designers and manufacturers who are trying to improve their products. I think it also draws public attention to the Design Centre and to all the stuff that is in it, so that in fact the real Designs of the Year are all the things that have been shown in the Design Centre and accepted here. And probably one other thing that the Centre does—no manufacturer who is able to show here can turn round and say that he cannot find what the public wants or thinks. Even if he does say he knows what the public wants he can always come here and find that he is right.

"The Centre, I believe, has done a wonderful job and I personally would like to see many more of them in various parts of the country. I would also like to see for the manufacturers' help even an index of foreign goods so that it could be used for comparison purposes, and possibly even used to stimulate new ideas. I do not think that at the moment British manufacturers can take things easily: there is a tremendous opportunity offered by new materials, new ideas, new techniques and new requirements. In meeting this challenge the Council of Industrial Design and the Design Centre exist to help the manufacturers all they can."

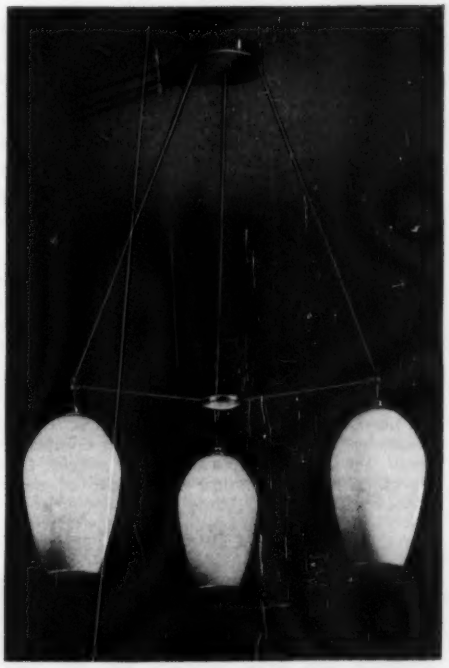


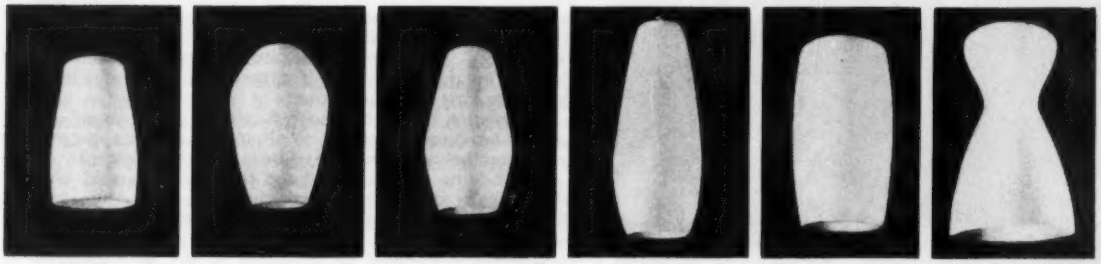
Satina

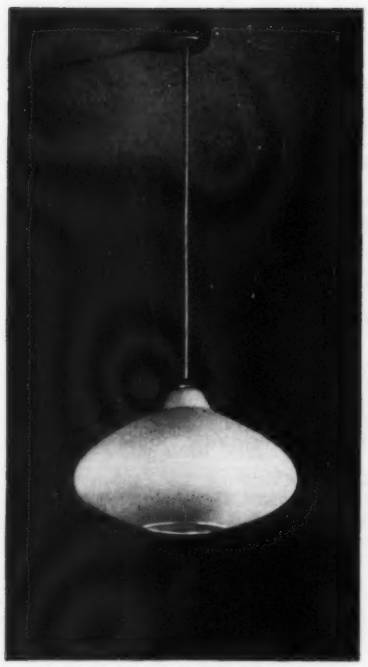
From this range the Council of Industrial Design has chosen

'THE LIGHTING FITTING OF THE YEAR'

British Design
British Manufacture







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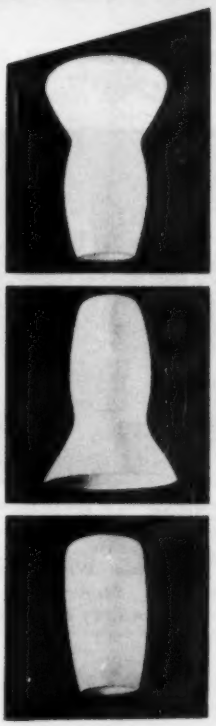


Lighting the Small Stage

(Continued from page 224)

need wide-angle reflectors. For flooding a curtain used as a backing to a dance display, a 500-watt size of flood on a telescopic stand in the wings either side of stage about level with E in Fig. 5 can be effective.

Lanterns for stage work should be strongly constructed but light in weight as life in quick scene changes can be hard.

Conclusion

In summarising this article, I would say that the total load provision for the stage could be anything from 40 amps to 100 amps, and this should preferably be single phase where schools and amateurs are concerned. Where this is not possible, the stage floor, at any rate, must be in one phase. The keynote of the electrical and lighting installation must be flexibility; no two stage productions are the same and no two users think alike. Although this is so, every endeavour should be made to use standardised components and equipment. To specify apparatus in a special form must mean less efficient manufacture and waste of money in circumstances where every penny counts.

I.E.S. ACTIVITIES

Mr. J. K. Frisby speaking at the dinner of the Hull section of the Leeds Centre on March 12.

The principal guests at the recent dinner and dance of the Bath and Bristol Centre. Left to right: back row, Maj-Gen. G. L. Watkinson, D.S.O., The President, Mr. R. H. Hill (Chairman), Mr. H. Harding (Chairman, Bristol Branch E.C.A.); front row, Mrs. Watkinson, Mrs. Sawyer, Mrs. Hill and Mrs. Harding. The function was attended by 135 members and guests.

Nottingham Centre

During the last 18 years the organisation of refreshments before sessional meetings of the Nottingham Centre has been in the hands of Mrs. C. S. Caunt, wife of a former chairman of the Centre. At a recent meeting of the Centre members showed their appreciation of the very valuable services given by Mrs. Caunt when they presented her with a matching necklace, bracelet and ear-rings. The presentation was made by the Centre chairman, Mr. I. A. A. Macdonald.

Correspondence

Courses in illuminating engineering

Dear Sir,—This letter is not intended to arouse controversy but we wish to avoid possible misunderstanding of the position at the Northampton College of Advanced Technology, London, which may arise from the last paragraph of Mr. Penny's Random Review in the February, 1958, issue of *Light and Lighting*.

On designation as a College of Advanced Technology the Northampton was required to transfer its City and Guilds Craft courses and those for National Certificates. As many of these courses had their beginnings at the Northampton and the traditions extended back over half a century it was hard to break the associations, but in every case the courses discontinued were transferred to another college with appropriate interests and experience. In the case of Illuminating Engineering we were happy to transfer the courses to the Borough Polytechnic.

We should make it clear that the more theoretical and advanced aspects of Illuminating Engineering, far from being neglected at the Northampton College, are included in the final year for all students of Ophthalmic Optics and in the second year of the Electrical Engineering degree course. It is an optional subject in certain courses for the Diploma in Technology and courses are also offered in Illuminating Engineering in preparation for the Institution of Electrical Engineers Part III examinations in this subject.

Researches are being carried out on problems of colour and vision directly related to illumination and photometry and a number of papers have been published recently.

From time to time we hope to offer advanced courses which will demonstrate conclusively that we believe Illuminating Engineering is a subject worthy of study at the most advanced levels.

C. A. PADGHAM.

Northampton College of Advanced Technology, London.

Personal

Mr. V. L. TURP has been appointed Northern Sales Manager for Ekco-Ensign Electric Ltd. and will operate from the Manchester office.

MR. P. E. GRAHAM, who joined Ekco-Ensign Electric Ltd. six years ago as a Sales Representative, has now been appointed Southern District Manager within the Southern Sales Area.

MR. F. A. THIEL has resigned his position as Northern Area Manager for Ekco-Ensign Electric Ltd. and has joined Laycock Engineering Ltd. of Sheffield.

MR. E. S. EVANS, General Manager of Ekco-Ensign Electric Ltd., has been appointed to the Board of Directors of the Company. Mr. Evans joined the Lighting Division of E. K. Cole Ltd., in 1942, and was for some time Works Manager at Southend. Following the formation of Ekco-Ensign Electric Ltd., he became Sales Manager in 1945, and in 1951 General Manager. After training as an electrical engineer, Mr. Evans joined the Elma Lighting Service Bureau on its formation in 1924 and was well known for his lighting development work in London, Newcastle, South Africa and Australia.

AEI Lamp and Lighting Company Ltd. announces the appointment of Mr. M. K. JOHNSON, Dip. MIES, as Regional Lighting Superintendent, Midland Region, in succession to Mr. H. G. Lilley who is now Manager of the Company's Lighting Department. Educated at Alleyn's School, Dulwich,

and the Borough Polytechnic, London, Mr. Johnson joined Siemens Electric Lamp & Supplies, London, in 1936, as an assistant in the Illuminating Engineering Department. After serving in RAF Bomber Command during the war, he rejoined Siemens in 1946 and was appointed Lighting Engineer for the Midland Region. In 1952 he joined Metropolitan-Vickers, Birmingham. On the formation of the AEI Lamp and Lighting Company he became responsible for the Company's street lighting activities in an area corresponding with that of the East Midlands Electricity Board.

MR. A. G. SMITH, A.M.I.E.E., Dip. M.I.E.S., has been appointed Manager of The Benjamin Electric Ltd. Engineering and Research Department and has now taken up his duties. Mr. Smith was for many years one of Benjamin's Sales Engineers, and in recent years held the position of Manager, Northern Sales Area. Mr. J. A. Studholme, who has held the appointment of Chief Technical Engineer for the past few years, will continue in that position.

MR. L. E. E. LANGDON, Sales Engineer in Yorkshire, has been appointed Manager, Benjamin Northern Area, and the Leeds Branch of The Benjamin Electric Ltd.

MR. OWEN THOMAS, formerly in the fittings' design department of Troughton & Young, has joined Hiscock, Appleby & Co. Ltd., as Chief Designer. MR. H. J. SQUIRES has taken over the position of Southern Area Representative for the company.

Philips Electrical Limited announce the appointments of Mr. J. D. CALLAWAY as Manager of their Cardiff Branch. Mr. Callaway joined Philips as a lighting engineer with the Cardiff Branch in 1951 after service with a London firm of consulting engineers and, earlier, with Metropolitan-Vickers Electrical Co. Ltd. He was Chairman of the I.E.S. Swansea Group in 1950 and of the Cardiff Centre in 1956.

Obituary

C. P. BANHAM

It is with deep regret that we record the death of Mr. Clifford Palmer Banham, a very well-known and esteemed member of the lighting industry. He died suddenly at his home at 124, Whiteleaf Hill, Whiteleaf, Surrey, on March 17 after a short illness. He was 59 and leaves a widow.

Cliff Banham was born and educated in South Africa, and during the Great War, although under age, served with the Coldstream Guards in France and was wounded in action. Damage to his wrist frustrated his original intention of following the family tradition by becoming a surgeon, and he joined BTH as an apprentice at Rugby in 1919. Following the 1929 merger he was appointed Chief Lighting Sales Engineer with the Edison Swan Electric Co., Ltd., and was subsequently appointed Manager of the Lighting Section in 1947 and joined the AEI Lamp and Lighting Company on its formation in 1956. He was a past Vice-President of the ECTA and a member of the IES, the APLE and the Lightmongers.

Trade Literature

SYLVANIA ELECTRIC PRODUCTS INC., 1740, Broadway, New York 19, N.Y.—Three new illustrated booklets describing various aspects of commercial, industrial and residential lighting. "More light where you need it with reflector lamps," "Incandescent lighting guide book," and "The story of Infra-red lamps."

THE TELEGRAPH CONSTRUCTION & MAINTENANCE CO. LTD., Mercury House, Theobalds Road, London, W.C.1.—A catalogue with illustrations entitled "Telcon Audio Frequency Cables," giving details of general characteristics and installations. The types suitable for local distribution—underground, aerial-suspension and underwater, being dealt with.

COURTNEY, POPE (ELECTRICAL) LTD., Amhurst Park Works Ltd., London, N.15.—New ideas on lighting contained in an illustrated leaflet including global spotlights, fluorescent and tungsten fittings. Also available, leaflet on modular and luminous ceilings.

Lewis's, Bristol

The lighting equipment for the new Lewis's store in Bristol, pictures of which were given in the April issue, was supplied by Courtney, Pope (Electrical) Ltd.

Velsen Road Tunnel

The fittings shown in Figs. 8 and 9 in the above article in the May issue were made by "Industria," Holland.

Situations

Vacant

JUNIOR LIGHTING PLANNING TRAINEE ENGINEER required for London Office. C. & G. I.E.S. Student preferred. Some experience advantageous, but not essential. Apply in writing with particulars to Ref.: SSV, Crompton Parkinson Ltd., Crompton House, Aldwych, London, W.C.2.

LIGHTING ENGINEER. A vacancy exists in the London Illuminating Engineering Dept., Atlas Lighting Ltd., for a Lighting Engineer. Asst. Engineers seeking advancement in a progressive organisation would be considered. Holiday arrangements honoured. Age 23-30. Write with full details to Staff Manager, Atlas Lighting Ltd., 105/109, Judd Street, W.C.1.

Applications are invited for an experienced SALES ENGINEER based on Liverpool to cover the sales of Industrial and Commercial Lighting Equipment in the Merseyside, North Wales and Cheshire Area. Attractive salary is offered to applicant who has the required sales and technical experience. Car will be provided and opportunity will be given to the applicant to join the superannuation scheme. Write in confidence giving full details of age, sales experience, education, training, etc., to The Benjamin Electric Ltd., 5, Corporation Street, Birmingham, 2.

POSTSCRIPT By 'Lumeritas'

YEAR by year Old Father Time takes a perverse delight in speeding up all the clocks as well as the relative motions of the earth and the heavenly bodies by which he marks his intervals. At least this is how it seems to me. "Time marches on" must have been said by a youngster; as an understatement it is a masterpiece, and he who first said "time flies" was surely a wiser, if older and sadder, man. It seems only a few months ago that I commented on the furore aroused by the erection of concrete lamp-posts in the Little Venice district of Paddington where, formerly, the cast-iron lamp-posts of the "Fanny by Gaslight" period held undisputed dominion and evoked esteem of unsuspected intensity. Yet my comment was made rather more than three years ago! Later in the same year, after attending meetings of the British Association in Bristol, I paid a visit to the picturesque, old-world, West Country village of Lacock. Now, like "the flowers that bloom in the spring," the Paddington lamp-posts had "nothing to do with the case," but a "marriage" has since been consummated between Lacock of the one part and the Paddington posts of the other part! This peaceful, unspoilt Wiltshire village lies a few miles south of the A4 road where it passes through Chippenham, and it is well worth a visit. Here, in 1801, was born Henry Fox Talbot, one of the "discoverers" of photography, and Lacock Abbey is still in the possession of the Talbot family. According to the latest News Letter of the National Trust, the street lighting at Lacock has now been improved in a manner befitting the character of the village. To do this the Parish Council bought a number of the Victorian-type bracket gas lamps discarded by Paddington and converted them, at little cost, to utilise electric lamps. So, from the turmoil and scurry of the Metropolis, these relics of a bygone age have gone into semi-retirement in one of those almost timeless villages that are a treasured part of our heritage. And here, bless 'em, may they long continue to gleam o' nights!

ANOTHER picturesque village where lighting has recently been improved, without detriment to the amenities, is West Wycombe, in Buckinghamshire. Here the National Trust has been able, through the help and co-operation of Mr. J. A. Parkinson, the borough engineer of High Wycombe, to choose post-top lanterns mounted on cast-iron pillars for the approaches to the village and to increase the number of bracket lanterns in the village itself. It is interesting to note that Dr. J. W. T. Walsh, O.B.E., advised the Trust on this scheme, which ranked for grant from the Ministry of Transport.

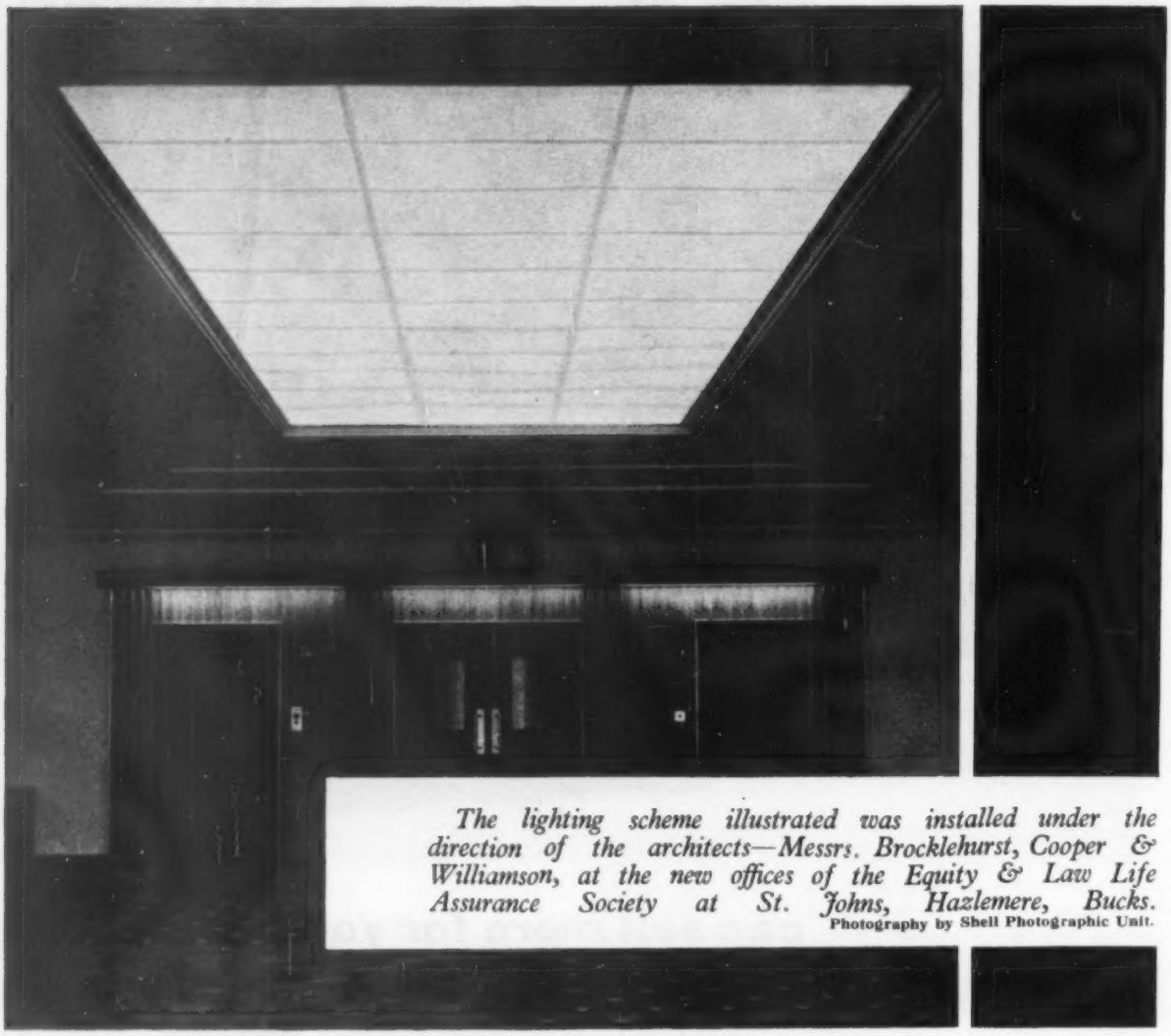
HARDLY had my comment on the "design of the visual field" been set by the printer last month than an impressive photograph was published by *The Daily Telegraph* of the relighted Choir of Gloucester Cathedral; the new lighting being, I believe, the outcome of design chiefly by that enthusiastic exponent of "designed appearance lighting," Mr. J. M. Waldram. Anyway, the scheme was designed by the GEC and special equipment was made to get the patterns of light and shade and the modelling required by Col. N. H. Waller, the Cathedral architect. Projection lamps, spotlights and reflector lights of the shop-window type are among the standard equipment used, and the needs of the choir are met by fifty wrought-iron desk stands equipped with candle-type lamps screened by gold-coloured shades. An interesting feature is a concealed spotlight arranged for profile lighting of the preacher in the pulpit. As far as one can judge from the published photograph, the results achieved show how rewarding careful and skilful designing can be.

EXPERIMENTS with electroluminescent panels for general-room lighting are being made in the USA and also, I believe, in France. Such panels have, of course, been produced and demonstrated in this country but their luminous efficiency is low. No doubt, if expense is no objection, adequate illumination could be got by covering the ceiling and upper parts of the walls with these panels and, in fact, a photograph of a room so treated has been published. This makes me quite sure that such a room is not for me—not at any price! The dominant impression is that of being in a glasshouse built of obscured glass under a sky of uniform and unvarying brightness. However, I realise that electroluminescent panels are, so to speak, only in the carbon-filament stage of lamp development and that, in the fullness of time, they may be numbered among the general service light sources and may be usable in lighting schemes one can live with contentedly.

SURELY one of the most unexpected reasons for installing street lighting is to secure a 30 mph speed limit on the roads! Yet, speaking in a recent debate in the Lords, Lord Somers is reported as complaining that some local authorities which have "bees in their bonnets" about speed are erecting lamp-posts merely to secure this limit. Lamps had been erected, he said, on stretches of road two miles long without a house in sight, and in open country. I wonder if the noble lord was misinformed as to the motive for these erections and whether, in fact, they were not for the purpose of street-lighting experiments?

SOME of the "small-lamp" luminaires now available are undoubtedly attractive. They have grace and elegance which is conspicuously absent from some of the spindly (and often exorbitantly priced) trash that is on offer to the public which—fortunately for the designers and purveyors of these oddities—includes a section that "falls" for anything odd so long as it is labelled "contemporary." I often wonder whether the "designers" of lighting fittings (forgive the anachronism!) that ape the retort stands which are time-honoured pieces of "chemy lab." apparatus, as well as others that are equally devoid of originality (besides having no particular functional merit) are poking fun at the public—as are the designers of the latest women's "fashions" and the "artists" whose "abstracts" are polychromatic drippings from the garden rake or some other misused implements.

PLASMATIC
INTERLOCKING DIFFUSER PANELS



The lighting scheme illustrated was installed under the direction of the architects—Messrs. Brocklehurst, Cooper & Williamson, at the new offices of the Equity & Law Life Assurance Society at St. Johns, Hazlemere, Bucks.
Photography by Shell Photographic Unit.

· · · *for illuminated ceilings laylights and lighting fittings*

Patent Application No. 37491/56. Reg. Design Nos. 882725, 882726.

Material	:	Extruded light stabilised Anti-static treated Polystyrene.
Colour	:	Translucent Opal and Clear.
Size	:	10½" wide centres × 4 ft. panels.
Weight	:	10 ozs. per square foot.
Light Output Ratio	:	54% to 60% Opal. 80% to 90% Clear.

Suitable for standard suspended ceiling construction, with or without ceiling board.
Easily removable for cleaning with damp cloth.

ask your ceiling contractor and lighting engineer for details · · ·

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Desborough Park Road, HIGH WYCOMBE, Buckinghamshire.

G.E.C.

POST-TOP DECORATIVE LANTERN

for STREET LIGHTING

Among its many outstanding features are :—

- Tapered cylindrical "Perspex" body incorporating sealed-in "Perspex" refractor plates.
- All spinnings in aluminium.
- Smooth exterior for ease of cleaning.
- Tube operating gear housed within the lantern under the top "mushroom" shaped spinning.
- Handsome bronze finish to exterior metal components.

The G.E.C. Post-top decorative lantern has been designed for use with two 2 ft. 40W. Osram guaranteed fluorescent tubes and is intended for side road lighting. Light control is obtained by two vertical mounted "Perspex" refractor plates — a unique feature.

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

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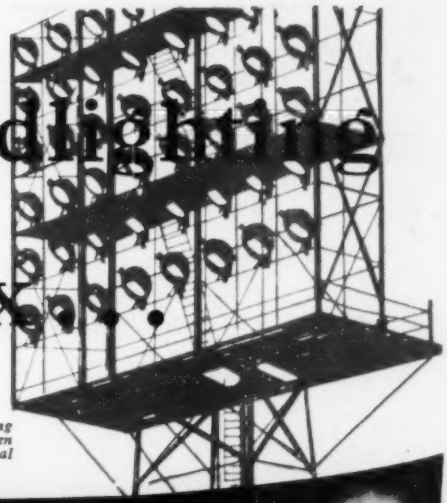
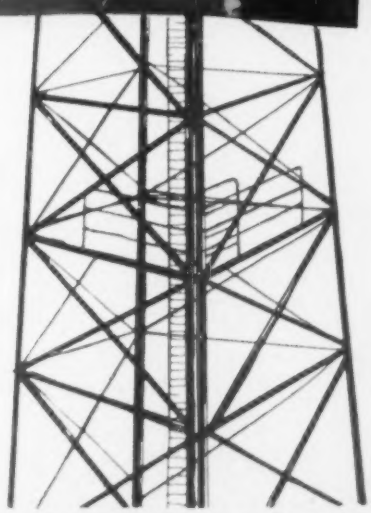
New REVO floodlighting at Molineux...



This action photograph showing Wolves playing Real Madrid under the new floodlighting was taken at 1/50 sec. at an aperture of f.11—i.e., a normal daylight exposure.



After exacting tests with floodlights of varied makes, Revo equipment was chosen to provide Wolverhampton with the finest football-ground floodlighting system in the country.

The four 146 ft. towers each support 48 Revo floodlights fitted with silvered-mirror reflectors and using Tungsten Filament Lamps, giving a total floodlighting load of 330 Kw. Facilities have been provided to increase the number of floodlights per tower to 60, giving a total load of 415 Kw.

Revo equipment has been specified for some of the most important installations of public and industrial lighting throughout the world, and the Wolverhampton Wanderers Football Club scheme is yet another example testifying to the high quality and efficiency of Revo products.

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